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AMERICAN
DYESTUFF REPORTER

VOLUME 28 JANUARY 9, 1939 NUMBER 1

Stability of

Hydrogen Peroxide Bleach Solutions

B. A. HAROLD

THE advantages of the hydrogen peroxide bleach process are evidenced in simplicity of application and resultant clear and permanent whites on textile fibers. Any economy in this method is completely dependent upon the chemical control which favors a gradual and uniform decomposition of the peroxide solution.

Doerfalt[1] pointed out the advantages of the hydrogen peroxide bleach process over those of the hypochlorites for cotton as follows:—

(1) It is more certain and definite in its action.
(2) No residue is left to remain as a sludge which may adhere irregularly to the clean fiber—water is left when H_2O_2 decomposes.
(3) The fiber is attacked to a lesser degree.
(4) The process as a whole is more rapid, since the kiering and bleaching may take place together.

Emphasis was made by Doerfalt upon one disadvantage in the hydrogen peroxide process and this was that there existed the possibility of a too rapid decomposition of the peroxide solution whereby only a small part of the oxygen was utilized. The need for uniform decomposition of the bath is therefore necessary to effect a maximum efficiency.

There are many factors which influence the stability of the H_2O_2 bleach bath, namely, type of material being bleached, type of bleaching machine, temperature, hydrogen ion concentration, and finally, type of alkaline assistants employed.

Before proceeding to a discussion of the stability of hydrogen peroxide solutions, it may be well to consider the chemistry of, and methods followed to produce this bleaching agent. Textile literature shows sparse references to this subject.

MANUFACTURE OF HYDROGEN PEROXIDE

The two principal processes for generating H_2O_2 are (1) barium peroxide—sulfuric acid method, and (2) the electrolytic processes. The last method produces by far the largest quantity of this chemical consumed in this country today, as well as producing solutions of the greatest strength.

The barium process is depicted in the following reactions:

(a) $H_3PO_4 + BaO_2 \rightarrow BaHPO_4 + H_2O_2$.
(b) $BaHPO_4 + H_2SO_4 \rightarrow H_3PO_4 + BaSO_4$.

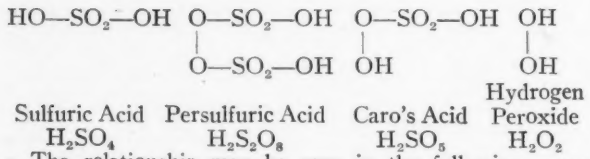
The electrolytic processes for the generation of hydrogen peroxide consists chiefly of the production of persulfates by electrolysis[2], from which hydrogen peroxide is distilled. There are three main processes:—

(1) The first method consists of the electrolytic production of ammonium persulfate, which is converted by double decomposition into potassium persulfate. The latter compound is then distilled with sulfuric acid to produce H_2O_2.
(2) The second process involves the direct electrolytic production of persulfuric acid, and its distillation to give H_2O_2.
(3) The third method of manufacture first produces ammonium persulfate directly, which is converted by distillation to hydrogen peroxide. The detail of this last procedure is as follows:—

Ammonium bisulfate in stoneware cells, by a process of electrolysis produces ammonium persulfate. This is distilled in specially designed stills under vacuum to produce H_2O_2 as a vapor, which is hydrolyzed and concentrated. The residual ammonium bisulfate is used over again in the cells. A peroxide of 100 volume strength possessing excellent purity and stability may be produced by this last process.

When an aqueous solution of fairly concentrated sulfuric acid[3] is electrolyzed between platinum electrodes, persulfuric acid, $H_2S_2O_8$, is first formed. In the presence of sulfuric acid, this acid is not very stable and changes rapidly, depending upon the concentration of the H_2SO_4, into Caro's acid, H_2SO_5. The latter undergoes further decomposition with the production of hydrogen peroxide.

To obtain a better picture[4] of hydrogen peroxide in its structural relationship to its intermediate preparatory products in the electrolysis, we are herewith showing the following structural formulae:—



Sulfuric Acid	Persulfuric Acid	Caro's Acid	Hydrogen Peroxide
H_2SO_4	$H_2S_2O_8$	H_2SO_5	H_2O_2

The relationship may be seen in the following equations:—

$$H_2S_2O_8 + H_2O \rightarrow H_2SO_5 + H_2SO_4$$
$$H_2SO_5 + H_2O \rightarrow H_2O_2 + H_2SO_4$$

It is interesting to note that the two per acids, persulfuric and Caro's acid are readily distinguishable from hydrogen peroxide by the fact that they do not decolorize potassium permanganate.

In commercial practice, the electrolyte is either a saturated solution of purified ammonium sulfate or an almost saturated solution of this salt made acid with H_2SO_4. Two-tenths per cent of potassium bichromate or potassium chromate is added to the electrolyte to reduce cathodic reduction of the persulfate formed.

The anode consists usually of platinum in the form of either sheet, gauze, or wire, sometimes held in a frame of zinc, while the cathode is usually lead in the form of the tank lining. The cathode may consist of coils of lead pipe or cast sections of lead which are water cooled.

The cooling of the electrolyte is done in either of two ways. In one system the electrolyte is circulated while the persulfate of ammonia is continuously removed. Here the cells are immersed in holding tanks containing coolants. In the second system the liquor is cooled by use of lead cooling coils which are part of the cathode surface in the tank.

Ammonium persulfate starts to decompose at 40° C., while at 60° C., the persulfate decomposes as fast as it is formed. At no time in the electrolysis is the temperature allowed to rise above 30° C.

Hydrogen peroxide made by any of the above methods is stabilized with an organic stabilizer to meet storage conditions. This step is one of great importance, as a peroxide of poor stability will yield inefficient results in bleaching.

STUDY OF STABILITY OF H_2O_2 SOLUTIONS

All references to the hydrogen peroxide which was used by the writer in experimental work will be to the 100 volume strength produced by electrolysis. This concentration (approximately 28 per cent) is such that one volume of peroxide is capable of the release of 100 volumes of oxygen. An interpretation of this in a more practical manner is that a bleach bath containing one gallon of 100 volume H_2O_2 in 100 gallons of liquor is termed a one volume bleach bath.

The experimental work was carried out under the direction of Mr. S. C. Lilley, Chief Chemist, American Mills Co., Hamden, Conn.

The destabilizing effect of the various assistants, such as alkalies and buffer, upon hydrogen peroxide solutions, without the presence of any fiber or fabric was the source of study. Those investigated were the ones chiefly found prevalent in a bath used for kier bleaching cottons, namely, sodium hydroxide and sodium silicate. The destabilizing effects of sodium carbonate was also studied, the reason being that if encouraging results were obtained with it, this alkali might supplant hydroxide for producing softer goods, without the harshness usually encountered with an alkali like caustic soda.

The apparatus depicted in Figure 1 was set up. A 1000 cc. Erlenmeyer flask was placed upon a tripod over a Bunsen Burner. A cork stopper was prepared which contained three holes, so drilled as to produce snug fits for the condenser, thermometer and a free hole from which test portions were withdrawn by means of a pipette for test purposes.

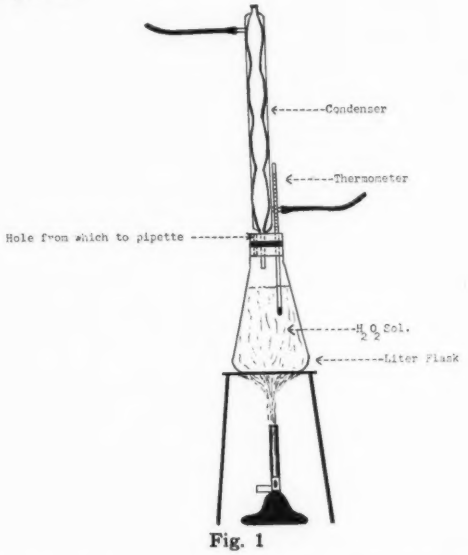


Fig. 1

The apparatus was arranged so as to emulate the kier as far as possible. Little loss of solution occurred as the vapors were recondensed in the condenser. The apparatus was always kept at 180° F. which approximated that of the practical kier, and the solution contained in the flask was tapped at fixed intervals for titrations. Oxygen loss was determined by titration with N.025 $KMnO_4$ solution, 16 cc. of which just gave a permanent color in an acidified one volume H_2O_2 solution. In each series of tests the strength of the assistants used in the peroxide solution approximated that employed in the actual kier, while a one volume peroxide solution was taken as the standard test solution. The sodium silicate used was the 42° Bé. Na_2SiO_3 type.

Curve A shown in Figure 2 first indicates the natural decomposition of a hydrogen peroxide solution in tap water with a pH of 7.6, secondly how this hastened by the addition of caustic soda (Curve B), and thirdly, the stabilization of this alkaline peroxide solution with sodium silicate (Curve C).

The rapid decomposition of the hydrogen peroxide solution by sodium carbonate is shown in Curve D. This is slowed up by the addition of sodium silicate as indicated by the flattened Curve E. But the striking observation is

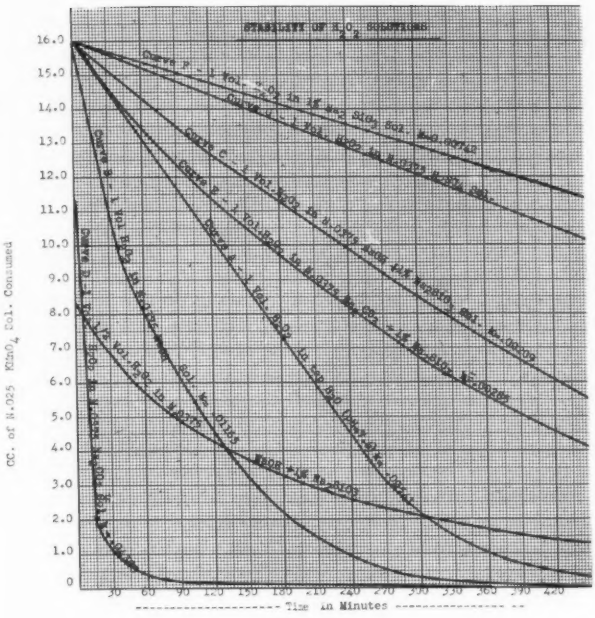


Fig. 2

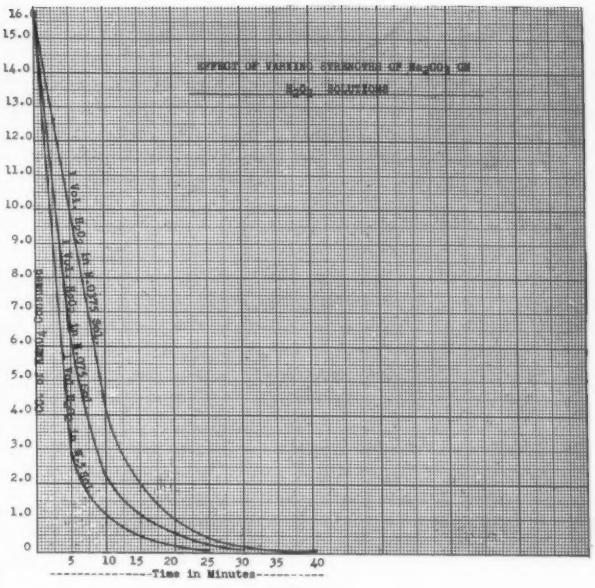


Fig. 3

that sodium carbonate appears to be far more drastic than sodium hydroxide in liberating the oxygen from the peroxide solution.

In order to study this very active action of sodium carbonate, varied concentrations of the alkali were added to a one volume peroxide solution and the loss of oxygen noted. Figure 3 indicates clearly that the rapidity of decomposition varies with the greater concentration of the sodium carbonate. This action seems to differ from that of sodium hydroxide, as higher concentrations than that of N.0375 do not show drastically increased decomposition of the hydrogen peroxide.

Curve F in Figure 2 shows how a buffer like sodium silicate alone greatly diminishes the oxygen loss. Curve G depicts a very interesting curve, that of the action of a N.0375 sulfuric acid solution. Here we note a very gradual evolution of oxygen in the presence of acid. We might point out that the cold bleaching of woolens with hydrogen peroxide has as its basis, the decomposition of the peroxide in the presence of an acid like oxalic acid.

It was deemed advisable to devise an equation which would serve as a basis for calculations to produce a constant, "k," for each set of experiments. The following mono-molecular equation was used:—

$$k = \frac{d(=2.303)}{t} \times \log \frac{C_o}{C_c} \text{ where}$$

d = differential
t = time of titration
Co = original titration in cc. at 0 minutes
Cc = titration in cc. at time (t)

The value of k is shown for several of the curves in Figure 2. Table A shows the value of k which was obtained in the set of experiments to show the H_2O_2 decomposition in the presence of Na_2CO_3 and sodium silicate.

A control was carried out on a mill run of 1600 lbs. of yarn in a steam injector type of kier, which was kier bleached as follows:—

A mixture of 60 lbs. of sodium silicate, 10 lbs. of caustic soda and 30 lbs. of a penetrant, soluble pine oil, were mixed in a separate mixing tank. This was run into the kier containing the yarn, and the latter wetted in this bath at the boil for one hour. Six gallons of 100 volume H_2O_2 were added and the bath was allowed to run at 180° F. for 5½ hours. Titrations were made upon entering the peroxide, and at regular intervals of 30 minutes throughout the kiering. The results of this mill run are shown in Table B with k being computed from the above equation.

BLEACHING OF WOOL WITH HYDROGEN PEROXIDE

It is apparent that the latest developments in the bleaching of wool encourage its processing from an acidic peroxide bath. This is illustrated in the following outline of a process patented in England[5].

Wool is bleached with an aqueous peroxide solution in a non-alkaline liquor which is fully inactivated by the addition of an inactivator other than the strong mineral acids. Representatives of this group are phosphates, borates, oxalates, lactates, isobutyl-naphthalene sulfonic acid, or oleoyl-methylaminoethane sulfonic acid. There is applied to the goods an activator (the most prominent one being soap), before immersion into the bleach bath.

Example—Scoured wool is prepared for bleaching so that it retains 1 per cent of its weight of soap. It is then treated at 40° C. in a bath containing 0.5 per cent H_2O_2 and 0.03 per cent of oxalic acid.

It is interesting to note that the newer sulfonated higher

TABLE A
Decomposition of 1 Volume H_2O_2 in N.0375 Na_2CO_3 + 1% Na_2SiO_3 Solution

Time in Minutes	*cc. of N.0375 $KMnO_4$ Consumed*	*k*
0	16	—
30	14.60	.00305
60	13.50	.00282
90	12.60	.00265
120	11.40	.00282
150	10.50	.00281
180	9.90	.00267
210	9.00	.00274
240	8.30	.00273
300	6.80	.00285
330	6.30	.00283
360	5.80	.00282
390	5.00	.00298
420	4.60	.00297
450	4.20	.00297
480	3.65	.00308
		.00285 (Av.)

TABLE B
Control on Practical Kier Bleach

Time	*Hours*	*$KMnO_4$ Consumption*	*k*
6:30 A.M.	0.5 hours	—	
7:00 A.M.	1.0 hours	—	
7:30 A.M.	1.5 hours	Peroxide entered	
8:00 A.M.	2.0 hours	2.90	
8:30 A.M.	2.5 hours	2.60	.00364
9:00 A.M.	3.0 hours	2.00	.00619
9:30 A.M.	3.5 hours	1.80	.00530
10:00 A.M.	4.0 hours	1.50	.00549
10:30 A.M.	4.5 hours	1.40	.00485
11:00 A.M.	5.0 hours	1.20	.00490
11:30 A.M.	5.5 hours	1.10	.00461
12:00 M.	6.0 hours	1.00	.00444
12:30 P.M.	6.5 hours	0.9	.00433
1:00 P.M.	7.0 hours	0.8	.00429

alcohols have been mentioned as stabilizers of hydrogen peroxide solutions. Folgner[6] has stated that Igepon T added as a stabilizing agent to a peroxide bleach liquor is decomposed after some time by the hydrogen peroxide, necessitating fresh additions of the alcohol from time to time. The duration of the activity of this stabilizing agent depends upon the time, temperature, and the concentration of the H_2O_2 used. The presence in the bath of salts which produce hard water, lowers the stabilizing action of Igepon T or any sulfonated aliphatic alcohol. In this connection, Folgner observed that calcium salts are more detrimental than magnesium salts, and with the exception of calcium chloride, sulfates are less detrimental than chlorides.

As a rule peroxide bleach baths prepared in hard water are more stable than those made of soft water. Campbell[7] pointed out that magnesium is more important than calcium in its stabilizing action as even small traces of it produce a considerable stabilizing effect. The main disadvantage of the presence of these metals exists in the formation of many insoluble compounds with other substances, the results of which cause trouble in the processes subsequent to bleaching.

The hydrogen peroxide bath used for the bleaching of woolens has been a source of study, especially from the standpoint of producing a minimum of impairment of the wool fiber. Wilkerson[8] concluded that the pH of the bleach bath has the greatest influence on the stability and efficiency of the bleach. Sodium silicate or pyrophosphate of soda alone or together with ammonia served as the best regulators of the pH.

It was Wilkerson's opinion, that a pH of 8 was most preferable for bleaching wool, while a higher pH (9 to 10) might be used for piece goods such as blankets, because the goods when carried over the reel tended to lower the temperature of the bath, with a consequent lowering of oxygen loss. A mixture of sodium pyrophosphate and oxalic acid was found to be an excellent buffer. It was shown that this mixture produced an effective buffering action to the acidity resulting when the bleach bath tended to become acid by the oxidation of the impurities in the wool.

Wilkerson made an interesting reference to the use of sodium oxalate as a buffer in the peroxide bleaching of vegetable fibers. He pointed out that the oxalate is absorbed by the fiber, and reacts with the contained H_2O_2 to produce an alkaline zone, thus neutralizing the acidity produced by the oxidation of any impurities.

Armand[9] found that the oxidizing action of hydrogen peroxide produced little alteration in the wool fiber itself, but did increase its sensitivity to alkalies. He cautioned against the use of temperatures above 65°-70° C. and advocated an optimum concentration of one to one and one-half volumes for effective bleaching. Actually the best results were obtained by bleaching at 50° C., but the H_2O_2 decomposed so slowly that it was necessary to use greater heat.

One point brought out by Armand has not been in full agreement with the writer's experience. This is that the duration of bleaching has little influence upon the fiber, and if the bleaching is incomplete, it is better to prolong the treatment than raise the temperature. We ourselves have noted that it is very possible to over-bleach, and hence, yellow woolen piece goods by too prolonged a bleaching operation, at lower temperatures, even in an only one volume bath.

Armand emphasized the importance of a proper pH in the bleaching liquor, stating that the degradation of the fiber increased rapidly above a pH of 8.5.

Many of the views of Armand were originally postulated by Smith and Harris[10]. Their research indicated that wool oxidized with hydrogen peroxide has a smaller cystine content and higher solubility in alkali than un-

treated wool. This increase in alkali solubility is a function of the amount of oxidation, and affords a reproducible method of measuring the extent of oxidation. Although the main point of attack during oxidation is the disulfide group, other groups may be attacked, affecting the alkali solubility, but not the cystine content of the wool.

Smith and Harris found that the rate of oxidation increases with a rise of temperature especially above 50° C. Below pH 7 the hydrogen ion concentration of the peroxide solution has no appreciable effect upon the oxidation of the wool. Between pH 7 and 10, the alkali solubility increases while the cystine content decreases with the increase in pH. Above pH 10, both the cystine content, and the alkali solubility decreases. This is because above a pH of 10, the alkali concentration in the peroxide bath is sufficiently high to dissolve a portion of the wool that ordinarily would be removed in the subsequent alkali treatment. When the loss in weight in the peroxide treatment is added to the loss of weight in the alkali treatment, the total loss in weight is in better agreement with the decrease in cystine content.

In studying the effect of varying the duration of the treatment of wool, with hydrogen peroxide, the investigators found that in a two volume bath for periods of time varying from one to twenty hours, that the cystine content decreased while the alkali solubility increased with an increasing time of treatment. This is in agreement with practice, as stated previously, wherein wool may be degraded by prolonging the time of bleaching too greatly.

CONCLUSIONS

In reviewing the foregoing we may conclude that a hydrogen peroxide bleach bath which is utilized for the bleaching of cotton, when prepared with the usual alkalies does not have as good a stability as one containing sodium silicate alone or in combination. Although sodium carbonate if substituted for sodium hydroxide might produce a softer and less harsh cotton, it possesses the drawback of drastically decomposing a H_2O_2 solution. For economical and well controlled bleaching, it is evident that a properly silicate buffered peroxide solution, with caustic soda as the alkali, will yield a smooth and consequent efficient decomposition.

In the case of wool, where a minimum of fiber degradation is sought, a uniform decomposition may be attained by use of (1) proper temperature, (2) properly buffering the peroxide solution with either silicate or pyrophosphate of soda, and (3) adjustment of pH with ammonia along the lines discussed in the foregoing.

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The Processing of

Acetate and Viscose Rayon Fabrics

Part IV—The Finishing of Acetate and Viscose Rayon Crepes

C. B. ORDWAY, M.S.

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(Continued from December 12, 1938, issue)

THE following routings of the finishing operations apply to general practices observed in the industry:

(See outline for routing on the finishing of white goods—Part II).

Routing No. 1—For Dyed Crepes

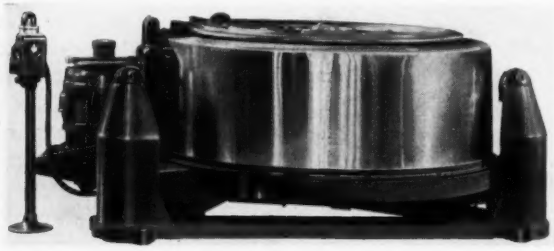
Hydro-Extraction or Vacuum extraction.
Opening of goods.
Drying of goods without finish.
Inspection of goods for shade before finish is applied.
Framing for initial width of 32-34 inches.
Finish applied on quetsch.
Drying of goods with finish.
Inspection of goods after drying.
Final framing to desired width—39-40½ inches.
Calendering or decatizing.
Final inspection.
Tubing, measurement for width, and shipment.

Routing No. 2—For Dyed Crepes

Hydro extraction or vacuum extraction.
Goods opened and beamed.
Finish applied on quetsch using a spreader to prevent creases on fabric from quetsch.
Drying of goods with finish.
Inspection and checked for shade.
First framing to 32-34 inches.
Final framing to desired width—39-40½ inches.
Calendering or Decatizing.
Final inspection.
Tubing, measurement and shipment.

Hydro-Extraction of Crepes

The lighter weight crepes of the 2 x 2, 4 x 4, gamzas, and some heavier types are usually bundled from the dye-box and hydro-extracted in the standard centrifugal extractor, similar to photograph shown. (Figure No. 19).

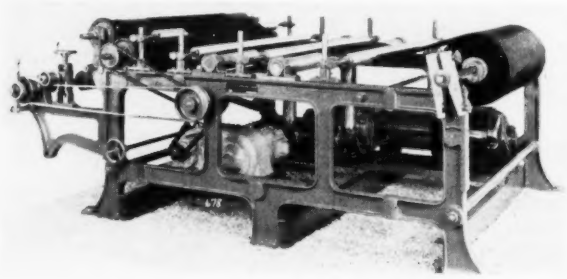


(Courtesy of the Rochester Engineering & Centrifugal Corp.)

Fig. 19—Modern Type of Centrifugal Hydro-Extractor. Equipped with Latest Safety Devices and Stainless Metal Construction.

The goods are run 4-6 minutes in this type hydro-extractor until they hold approximately equal amount of moisture as dry weight of fabric. The goods are opened up ready for finishing according to routing method No. 1 or 2.

The alpaca and romaine novelty and staple qualities are removed from dye-box in full width and folded ready for hydro-extraction over the piece-goods vacuum extractor as shown in Figure No. 20.



(Courtesy Van Vlaanderen Machine Co.)

Fig. 20—Full Width Vacuum Machine for Piece Goods Extraction. Equipped with Variable Speed Drive, Slip-Belt Take-up, and Tension Control Let-off.

Vacuum extraction of crepe fabrics is used in preference to the hydro-extraction of goods in the bundled form. The bundled goods may be over-extracted and this will cause break-marks on the heavier crepes as well as partially dried out spots prior to the drying or applying of the finish on the quetsch. The over-extracted goods with partially dried out spots are usually the source of blotchiness on the finished dyed goods.

The goods after extraction on the vacuum extractor are then ready for subsequent finishing operations.

All goods after hydro-extraction must be kept well covered with wet cloths until ready for opening. Some plants prefer that the dyed crepes be held in the wet condition until there are sufficient number of opening operatives ready to take care of the freshly extracted goods instead of having them extracted and covered with wet cloths as they come off the dye-boxes.

Opening of Dyed Crepes in the Bundled Form

The opening operation may be carried out over a large reel sufficiently long enough to carry several lines of dyed crepes simultaneously, without tangling on the nearby operative's goods.

Such a type of reel is economical as to operation and one experienced sewing machine operative can usually take care of the necessary sewing of seams on the different ends of the dyed pieces as they are reeled off together.

The single piece reel is widely used and on this type, the bundled goods are placed in a revolving container or box and this permits the operative to use both hands in opening the goods as they are fed over the reel. The power cost is probably greater on this type, but is more versatile in its handling of dyed goods than the larger types in most cases.

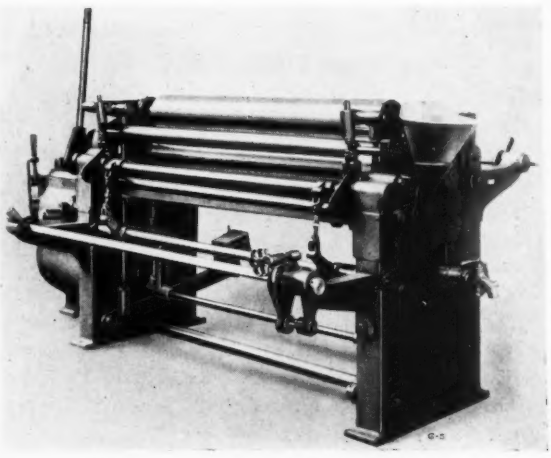
Routing No. 1 gives more checks on the goods and enables the dyer and finisher to return unsatisfactory dyed lots for reworking before they have gone through too many finishing operations.

Routing No. 2 is more economical as to time and greater production can be handled by this method.

There are many different types of novelty crepe fabrics such as the "thick and thin" (slubs), ribbed romaines, and other fancy crepes where it is preferable that their finishing agents be applied in the final rinse bath on the dyebox, as the quetsch affects the appearance of fabrics. Many different qualities of crepes could be finished this way, thus omitting the application of finishes on the quetsch largely, but this is not the common practice. There are many crepe fabrics difficult of penetration, and it requires the action of the quetsch to apply the necessary finishing agents satisfactorily. On heavier crepes, such as the staple alpacas, romaines, 4 x 4s, and similar qualities.

Fig. 21—High Pressure Two Roll Quetsch with Quick Change Gear Drive.

(Courtesy of the Morrison Machine Co.



FINISHING FORMULAS FOR USE ON QUETSCH

(Based on 50 gallons and applied at 100-200° F.)

Hard water is corrected with Meta Hexo Phosphate before finishing agents are added to 50 gallon mix. A small amount of hygroscopic agent is added to each mix.

No. 1— 6-8 quarts—50% Sulfonated Olive Oil

No. 2— 4 quarts—50% Sulfonated Olive Oil

No. 3—
- 3 quarts—50% Sulfonated Olive Oil
- 3 quarts—25% Sulfonated Tallow

No. 4—
- 4 quarts—50% Sulfonated Olive Oil
- 6 quarts—25% Sulfonated Tallow

No. 5—
- 4 quarts—50% Sulfonated Olive Oil
- 1 quart —28% Acetic Acid
- 1 quart —35% Sulfonated Coconut Oil or Tallow

No. 1 Formula can be used on heavy alpacas, romaines, 4 x 4s, "thick and thin," and crepons where a full soft and silky hand is desired.

No. 2 Formula can be applied on 2 x 2s, gamzas, and light weight crepe fabrics to give a moderately soft and mellow hand.

No. 3 Formula will give a soft and medium-bodied hand on light crepes such as 2 x 2, gamzas, etc.

No. 4 Formula will give a soft and very heavy bodied hand on 2 x 2, gamzas, and other light crepes. It gives a soft and full hand on alpacas and romaines.

No. 5 Formula is applied on the lighter weight alpacas, romaine sheers, and better quality 2 x 2s when a moderate softness with a full hand that gives good draping qualities desired.

There are many variations used with these typical formulas. Some finishers may reduce the amount of sulfonated olive oil and use a good quality mineral oil in the mix. This type of finish gives an airy hand to the crepe and is sometimes used on finishing the light weight crepes used in the blouse trade. Care must be taken when using mineral oils that sufficient emulsifying agents are used so that the bath will not separate.

Gelatine, converted starches, dextrine, and vegetable gums are added to some finishing formulas for stiffness and full body. Goods with finishes of this type are given a calendering or decatizing for final finish desired.

On heavier crepes such as alpacas and romaines when a soft and full hand is wanted in a permanent finish, this can be applied on quetsch using an emulsified formaldehyde resin plus a plasticizer or softener such as sulfonated olive oil or one of the sulfonated fatty alcohols.

There are other types of finishing agents used with varying amount of success. Some of these types are:

Sulfonated technical stearyl alcohol

Sulfonated technical oleyl alcohol

Sulfonated and free technical stearyl alcohol.

Extraction compounds from soya bean and like raw materials.

Protein compounds of the Lecithin nature.

Diethylamino-ethylstearylamide acetate and related products.

The first named fatty alcohols can replace the sulfonated vegetable oils and tallows with excellent results. They are free from rancidity and can be used under "hard" water conditions satisfactorily.

Plant practice has shown that the protein compounds possess high softening power and give the crepe fabrics a full hand with good draping qualities.

These products are used to advantage when run in conjunction with a sulfonated vegetable oil or fatty alcohol and in most cases give an improved finish over one made with a self-finish. The use of hygroscopic agents such as glycerine or di-ethylene glycol is always desirable for these finishing mixtures to enable the acetate fibers to take up all additional moisture possible.

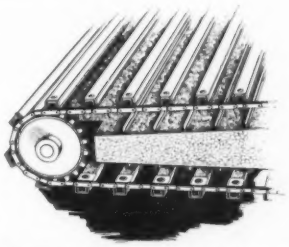
DRYING

Drying of crepe fabrics is best carried out on a loop dryer or one of the improved types of dryers for fine fabrics.

A suitable dryer for crepe fabrics must possess these points:

1. Permit even drying without loss of crepeage.
2. Give freedom from creases, wrinkles, and tangling.
3. Be versatile in its drying and usable on various fabrics and on any type of finishing.
4. The dried goods must possess a soft and mellow hand that comes only from evenness in drying.

These illustrations show the drying principles used on this modern type of dryer.



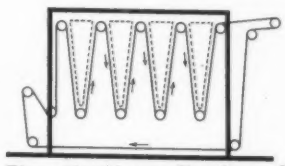


Fig. 23—Above—Routing of Goods Drying on Air-Lay Dryer.

Fig. 22—Left—Cloth Conveyor with Cork Faced Supported Girts and Air Ducts Holding and Drying Goods Simultaneously. This Equipment Is on the Air-Lay Dryer.

Illustrations, Courtesy of Proctor & Schwartz

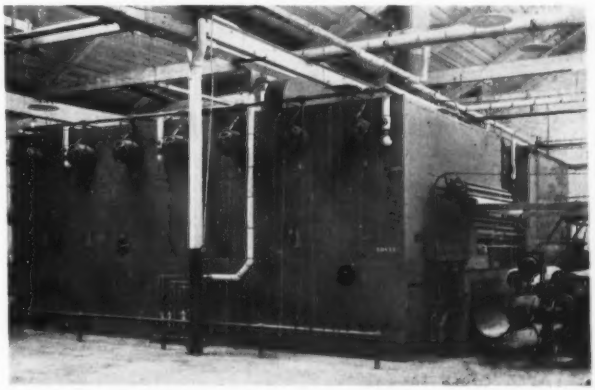


Fig. 24—Feeding-in End of an Air-Lay Dryer with Quetsch in Range.

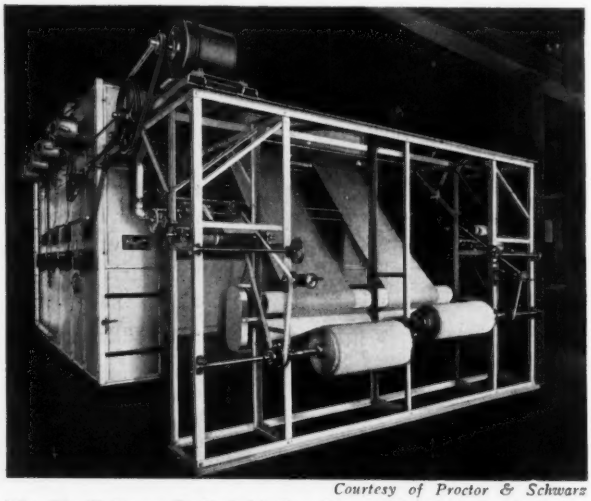
Figure No. 22 shows the cloth conveyor with cork-faced supported girts and air ducts that aid in holding the

goods in place and drying them simultaneously.

Figure No. 23 shows routing of goods through this type of dryer.

Figure No. 24 shows the feeding-in end view of a plant installation with a quetsch. The goods are fed into the quetsch either in the dried condition, as outlined on "Routing No. 1 for Dyed Crepes," or in the wet condition, as shown in "Routing No. 2 for Dyed Crepes.

Figure No. 25 shows the delivery end of the dryer with the dried goods being run onto shells from which they can be handled more satisfactorily than allowing the dried goods to be folded into boxes and then fed onto the tenter frame.



Courtesy of Proctor & Schwarz

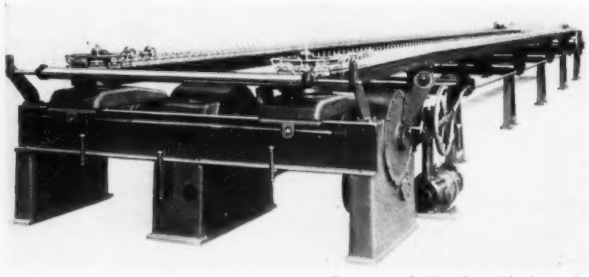
Fig. 25—Delivery End of Air-Lay Dryer Showing Goods Being Run on to Shells.

FRAMING OF CREPES

The purpose of tentering or framing is to pull the dyed or bleached goods uniformly to their desired width.

Crepe fabrics can only be stretched to a desired width through proper framing operations which are largely mechanical. Chemical agents applied to the setting of width have not proven of value at the present time.

This is carried out by an endless chain of clamps or clips which grip the goods at their selvedges and pull them to the width desired on that particular operation.



Courtesy of Morrison Machine Co.

Fig. 26—Delivery End of a Modern Tentering Frame. Equipped with Automatic Electrical Weft Straightener and Ball Bearing Throughout.

The two popular length frames for acetate and viscose rayon crepe are the sixty and ninety-foot sizes. The short frames are used for the initial framing of the dyed goods to widths of 32 to 34 inches while the longer frames take care of the final framing to the desired width with allowance being made for shrinkage.

Tenter frames of the modern types, suitable for acetate and viscose rayon finishing are equipped with some or all of these improvements:

1—Electric opening and closing device for the tenter rails. (An automatic electric finger on each side of the frame at the opening end).

2—Variable speed drives.

3—Special device to improve oiling of the clips and thus prevent any soiling of goods by oil spots.

4—Slip-belt take-up device.

5—Adjustable beam stand with swivel or swinging let-off stand which can be operated by foot pressure turning the wheel on the pinion gear thus permitting the operative to use both hands in feeding the goods onto the frame. This type of beam stand is usually equipped with a friction brake.

6—Special weft or filling straightener located on delivery end of frame.

7—Oversize steam boxes to provide sufficient steam for heavier crepes or goods creased from the scouring and dyeing operations.

8—Oversize radiators or gas heaters sufficient for rapid drying so that no damp crepes will be run onto shells from the delivery end of the frame.

It is desirable that all dye crepes be run onto shells after drying instead of being folded into boxes. Goods off from shells can be fed into a frame straighter and the operative can keep the filling lined up truer than when feeding folded goods off of a truck. A swinging let-off beam stand aids the operative greatly as the shell can be swung at any angle to the front of the frame so as to obtain uniform delivery of the goods onto the clips. Through the use of the swinging let-off stand and electric opening and closing device, the tension on the goods can be controlled advantageously and this is especially true when running goods off of a shell instead of being folded in a box. It is best to feed the dyed crepes slack into the entering clips. An experienced operative will just keep a shell turning slowly on correct feeding-in of crepes.

Some of the major precautions to observe for obtaining well framed goods are:

1. Clean and properly lubricated clips.
2. Correct width adjustment of frame for different qualities of crepes.
3. Entering of selvedges into clips at correct point.
   (a) Goods entering clips too shallow, the selvedge may pull out, thus giving uneven widths on framed goods.
   (b) Goods entering clips too deep, the selvedge may be torn.
4. Careful attention to the low tension allowed on the delivery end of frame, as this can affect the final crepe or pebble noticeably.

5. Heavy steaming and full drying power in first framing to remove wrinkles and creases for applying finish on the quetsch, and any subsequent finishing operation.

6. Lighter steaming and full drying for goods on second or final framing to required width as they must be free of creases and wrinkles to be finished properly on the calender or decater.

7. Proper regulation of speed of frame to obtain the necessary steaming and drying desired on crepes.

Too slow a speed may cause overdrying which gives many of the darker shades, navies, and blacks a metallic luster as well as affecting the feel and handle of finished goods.

Too rapid a speed may permit damp goods to be run onto shell which would affect the pebble and shrinkage desired.

CALENDERING

Crepe fabrics are calendered for the following purposes:

1. To give the calendered or finished crepes full draping properties with a soft and full hand.

2. To rearrange the surface of the crepe fabric by the calendering action. This is sometimes called "breaking the goods."

3. The rearrangement of surface of fabric helps to give a dull appearing goods.

4. Breaking up of the dyestuff and finishing agent particles that are lying on the surface of fabric due to drying and steaming (framing). This helps to remove the marking off of the finished crepe fabric.

METHOD OF CALENDERING CREPES

Acetate and viscose rayon crepes are usually calendered cold as this helps to lower the luster and aids in omitting the use of dulling agents in the finish when it is applied on the quetsch.

The lowest amount of pressure and tension is used on this calendering operation, so as to prevent excessive flattening of the pebble or crepe and shrinkage of finished goods.

If a high luster is desired on the finished crepe fabrics, then the operations would be carried out on a heated calender.

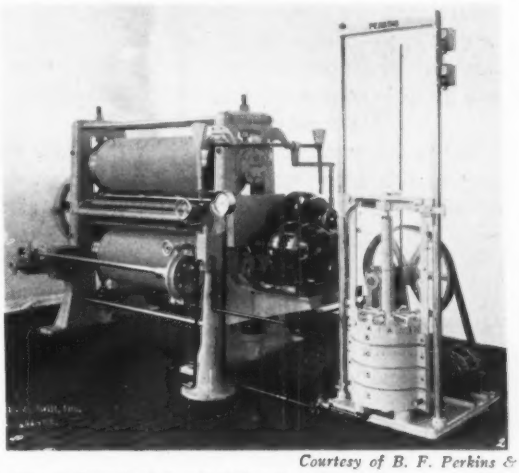
The average speed of calendering is 50-60 yards per minute.

A standard silk or rayon calender consists of three rolls aligned in vertical order and held by a steel frame. There is usually a system of levers and weights by which the pressure desired is applied to the rolls.

The top and bottom rolls are "soft" but the intermediate roll is of chilled iron and steam heated. All "soft" rolls of this type are usually covered with a composition wool felt paper which is very hard when compared to anything but an iron or steel cylinder.

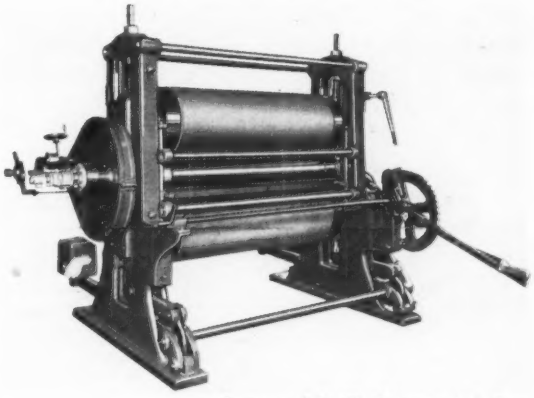
In threading up the calender the beam of goods to be calendered is placed on the stand at the front of the calender.

The end cloth is threaded over and around the two tension rods at the nip of the bottom roll and center iron roll. It is then threaded between iron and top rolls and back over the top roll. The end cloth is now pulled entirely through the nips of both rolls and the pressure is applied to rolls. Two operatives handle this operation; one of them carefully engages the clutch driving the iron roll, and the other wraps the end cloth securely around the shell or beam on the delivery end. The machine must not be stopped as there are calender marks at both ends of piece of goods from starting and stopping, and the marks are very difficult to remove.



Courtesy of B. F. Perkins & Son

Fig. 27—A Standard 3-roll Calender with a Pressure of Two to Twenty Tons Applied Hydraulically.



Courtesy of H. W. Butterworth & Sons Co.

Fig. 28—A Standard 3-roll Calender Using the Lever and Weights System. This Illustration Is of the Entering Side of Calender with the Lever Applied.

Precautions to observe in calendering crepes are:

1. The two soft rolls must be free of scars as they leave marks on the finished crepes which are all but impossible to remove even when goods are redyed again.

2. Just sufficient tension to wind the crepes on rolls evenly and free from wrinkles should be exerted. While goods are leaving the calender and being beamed, the tension must be kept at a minimum and free from any danger of stretching the crepe fabrics.

3. The rolls must be kept well washed and clean of any dye stains, finishing agents, or any material that may be impressed into the crepe fabric.

4. During the calendering of a piece of crepe the ma-

chine should not be stopped except in an emergency, as every stoppage makes additional "calender marks" on the finished goods.

DECATIZING OF CREPES

The decating machines have been used on woolen piece-goods finishing for many years. It has been only in the past few years that the decatizing operation has been applied to the finishing of acetate and viscose rayon crepe fabrics.

Woolens were processed on the theory that wool fibers become plastic when exposed to high pressure live steam and then with the subsequent cooling, the fibers were rearranged thus giving a high luster to the finished goods.

Methods of Decatizing

The 300 to 600 yards of goods to be treated are rolled up together with a blanket on a perforated metal drum covered with cloth. The operator must be careful that the goods are free from wrinkles before turning on the steam.

High pressure steam is forced outward through the various layers of goods until all layers are impregnated with the live steam.

The acetate and viscose rayon fabrics under high pressure steaming become plastic or moldable, and the fabric is then set by the steam being shut off which creates a vacuum in the metal drum and the cool air from outside is sucked through the layers of goods. The suction of cool air through the fabric layers dries out the moisture remaining from the steaming, and leaves the goods dry but possessing a high hygroscopic moisture content which is comparable to the feel of goods that have been allowed to dry in the air.

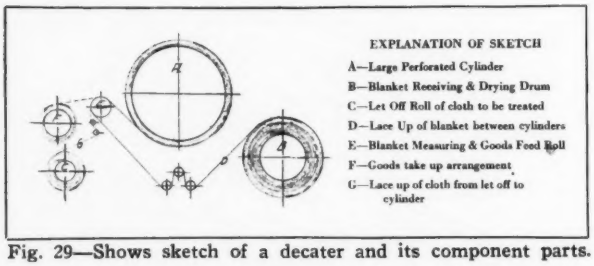

EXPLANATION OF SKETCH
A—Large Perforated Cylinder
B—Blanket Receiving & Drying Drum
C—Let Off Roll of cloth to be treated
D—Lace Up of blanket between cylinders
E—Blanket Measuring & Goods Feed Roll
F—Goods take up arrangement
G—Lace up of cloth from let off to cylinder

Fig. 29—Shows sketch of a decater and its component parts.
Courtesy of the Van Vlaanderen Machine Co.

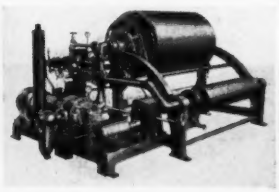


Fig. 30 — Decater without blanket, showing perforated metal drum.

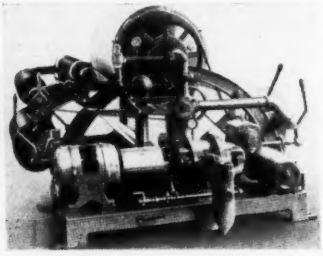


Fig. 31—Decater in actual operation with goods being decatized.

THE PURPOSE OF THE DECATIZING OPERATION

The boil-off and dyeing operations may leave many of the crepe fabrics with defects to be removed or remedied in the various finishing operations. The chief defects are:

1. Cracks or break marks.
2. A high metallic luster.
3. A wiry and harsh feel on goods.
4. An uneven or cloudy appearing dyed shade.
5. Lack of uniformity on the crepe or pebble.

The purpose of decatizing is to remove or remedy these defects that are difficult of remedying on other finishing operations. High metallic luster on finished crepes is objectionable and can sometimes be traced to over-drying or excessive tension on framing. Decatizing helps to give a duller appearance to the finished fabric as it resets the fibers under natural conditions without excessive tension on the fabric.

The wiriness is improved, chiefly due to the conditioning of the fibers from the steaming and cooling operation, thus giving the goods a soft feel and hand.

The uneven pebble and dyed effect are related and the steaming and pressing action of the blanket aid in giving a more uniform pebble or crepe and this naturally helps to remove the cloudy dyed effects present on freshly dyed and dried crepes.

There are different qualities of crepes that cannot be calendered satisfactorily as this operation tends to flatten the crepe or effect the appearance of the fabric too much and does not reduce the luster always.

Thick and thin, sheer and heavy romaines, and alpacas are some of the qualities in which decatizing has been used in finishing so as to obtain that subdued luster and softer hand wanted for the trade. The finishing materials used on the decatized goods is usually reduced from the standard formulas due to these agents penetrating the fibers to a greater extent during this operation.

INSPECTION OF FINISHED GOODS

The use of a tilted type of inspection table is becoming common practice as it enables the inspector to see the goods at different angles and make just criticism of any defects.

There are different types of lighting arrangements for use during cloudy days, at night, or where the inspection room does not have a good source of north-east daylight. These lighting units are obtainable from many of the electrical manufacturing companies specializing on textile lighting conditions.

The modern type of tuber was shown under Part II of this article. After tubing, the goods are sent to shipping department ready for shipping instructions.

(To be continued)

CORRECTION

IN the article entitled "Recent Developments in the Chemistry of Silk and Silk Processing" which appeared in our issue of November 28th, 1938, on page 715 under: 2. The Preparation of Silk—*Soaking*—"Soaking Silk, Etc." the wrong patent number is given. It should be U. S. 2,127,904.

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

JANUARY 9, 1939

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Members should notify the **Secretary** immediately of all address changes

CALENDAR OF COMING EVENTS

Meeting, Philadelphia Section, Penn A. C., Philadelphia, Pa., January 20, 1939.

Meeting, New York Section, Chemists' Club, New York, N. Y., January 27, 1939.

Meeting, South Central Section, Read House, Chattanooga, Tenn., January 28, 1939.

Annual Meeting, Inter-Society Color Council, New York, N. Y., Feb. 23, 1939—Details are announced on page P17.

Nineteenth Annual Meeting and Convention to be held under auspices of Northern New England Section in Boston during 1939. Date and headquarters to be announced later.

COMPLETE STENOGRAPHIC REPORTS OF

Technical Papers, Discussions, and Addresses delivered at the Eighteenth Annual Meeting will be published in future issues of the Proceedings.

SOUVENIR BANQUET MENU

Copies of the souvenir menu of the Annual Banquet at Atlanta are available upon request to Robert W. Philip, 1020 Grant Bldg., Atlanta, Ga.

Leaves from a

Dyer's Notebook*

BEN VERITY**

SOME years ago I said to Mr. Lord of the General Dyestuff Corporation that if they were short of a speaker some time I would be willing to help out and give a talk before the Rhode Island Section. My reason for doing this was the fact that I had benefited by being a member of the organization and I felt it was only fair that I should be willing to do my share toward the welfare of the association. That is the reason I now stand before you.

This is a favorable time to acknowledge my indebtedness to that body and I will mention just two incidents in this connection.

Some years ago Mr. Hebden gave a very interesting and instructive lecture on the "Chemistry of Vat Dyeing" before the Rhode Island Section. In his talk he spoke of the use of bicarbonate of soda as an acid salt to change the soluble leuco vat dye to the insoluble free leuco vat state, and how he could practically exhaust a Ciba Blue 2BD dye vat on the Franklin process machine by the use of this chemical, and could also dye mixtures of Indanthrene and Ciba colors by that process and produce level results and practically exhaust the dye bath.

To illustrate this, suppose he was dyeing a batch of goods with Ciba Blue 2BD and wished to exhaust the bath. He proceeded as follows:

He dyed to an equilibrium and we will suppose that at that stage there was 50 per cent of the dye left in the bath and 4 lbs. of caustic soda. He would add enough bicarbonate of soda to neutralize 2 lbs. of caustic soda and dye to a further equilibrium and then he would add more bicarbonate to neutralize half of the caustic soda that was left and again dye fifteen minutes to equilibrium once more and with this method he would continue until the bath was practically exhausted, then finally completely neutralized with bicarbonate and oxidized with air only.

At that time at the American Printing Company we were dyeing vat plain shades by the pigment pad process and were oxidizing with bichromate of soda.

With some colors the results were neither even nor satisfactory, so we tried Mr. Hebden's idea and ran the dyed goods, without rinsing, into a cold solution of 10-15 lbs. bicarbonate of soda in 25 gallons cold water, gave two ends, then washed in cold water only in the rope state.

The results were so good that we never used any other process and it may interest some of the dyers here to know that we never rope soaped our vat dyes, but washed in cold water only in the rope state to completely oxidize the color.

If the shade was one that changed on hot rope soaping, and we wished to so change it, the goods were put through the steam box or ager and that changed the shade. This cost less and was not so risky as rope soaping.

Another instance where I received great benefit from a meeting of the association occurred when Dr. Cotton spoke in Providence on the Naphthol AS colors.

I wondered whether to go to the meeting or not, as we had been using Naphthols for some years I felt that I would not get much out of the meeting. However, I went on the chance—but the reverse was the case.

He said they used Naphthol ASTR in Europe and he did not see why we did not employ it here also.

We had $5,000 worth which we thought we could not use as it was difficult to obtain good whites on goods prepared with it. I thought if they could use it in Europe we could use it in the United States.

By a combination of using it for certain patterns and the modification of the soaping of Naphthol Prepares we used it all in a short time.

After the lecture I went up to the table to look at the printed samples and I noticed a red signal flag with a large white square in the centre. This was a good white and the color was produced on Naphthol AS prepared goods.

I said to Doctor Cotton that they must have treated that drastically to get such a good white. He said, "I guess they had." Well, I thought if they could do it, maybe we could.

With this thought from the lecture I wondered if we could not replace Naphthol ASD, which gave good whites, with Naphthol AS in preparing goods for printing. Our head salesman would not accept the Scarlet on the Naphthol AS, but wanted the brighter color obtained from the Naphthol ASD.

Then a mixture of 10 parts AS and 4 parts ASD was tried and accepted.

This meant a saving of $50,000 per year because of the large amount of cloth we printed on prepared cloth in those days, chiefly for dress goods.

Naphthol AS at the time, I think, cost us $2.00 a lb. and ASD, $3.80 per lb.

In addition to the above two valuable results from attending meetings of the Association, I have also increased my

*Presented at meeting, Rhode Island Section, October 28, 1938.
**Carbic Color & Chemical Co.

acquaintance among members of the textile industry and obtained information from the Proceedings published in the DYESTUFF REPORTER, from time to time, that has been helpful. I can, therefore, suggest to those who are not members, that it might be to their advantage also to join the Association. As one superintendent said once, "If you cannot get anything, you may be able to give something."

DARK SELVEDGES

Sometimes a dyer needs to discharge and redye a Naphthol color that is not easily discharged, and the edges are left colored somewhat, so that when redyed the goods may be seconded on account of dark selvedges.

An underwater jigger will take care of this, but if it takes much liquor it is an expensive process. We overcame this difficulty as follows, at a low cost, and obtained good results.

There were two old cast iron jigbecks used only for boiling water. In these the engineer bored a hole in about the center of each end and put a roller in it, like the outside dyeing roll on a jig.

To run it we filled the jig with enough liquor (about 20 gallons) so that when cloth was run on to this lower roller the bottom half would always be in contact with the discharging liquor. This inside roller was fixed with a clutch and reversing gear connected with the outside rollers, just as the two outside rolls are on a regular jig so that the cloth could be run back and forth until discharged.

This home-made, inexpensive machine worked very well and the edges would be discharged just as well as the body of the cloth and a very short bath could be used.

SCRIMPS

When you prepare with Naphthol AS, some kinds of the better grades of cloth, scrimps are formed on the cans as the cloth is drying and these show as longitudinal light places when printing Fast Color Salts, or in dyeing plain shades.

If you wish to avoid this defect, the following procedure has been found successful in several plants.

After padding, sky some few yards (20 yards would probably be sufficient), before going on to the cans, and also add enough Glauber's salt crystals to the Naphthol AS prepare to prevent the migration of the Naphthol when the cloth scrimps on the can—10 lbs. of the crystals to 12½ gallons of Naphthol AS prepare will probably be sufficient; and furthermore, you need not lap the cans if you thus run the goods.

The Glauber's salt does not seem to interfere with the coupling of the Fast Color Salts and it makes, in one sense, the Naphthol AS more substantive.

This use of Glauber's salt and skying before drying can also be recommended when drying Indigosols if the solubility of the Indigosols will admit of its use. Particularly in this suggestion of value if you are using Indigosol Blue IBC and an Andrews & Goodrich hot air drier.

I think this method would enable some Indigosols to be dried successfully on cans, but no one, as far as I know, has been willing to try a large enough run to settle the point.

INDIGOSOL PLAIN SHADES

The dyeing of Indigosol plain shades has often given trouble to the dyer who uses them for the first time. I remember going to a plant where several light shades had been done, and they were not level from end to end as they had hoped they would be.

The reason for this was that they had run them through the liquor and had not strengthened the feed liquor, as this latter procedure is more or less troublesome and especially so with mixtures. I suggest that you pad Indigosols not through the liquor but to the nip, then no strengthening of the feed liquor is necessary and the shade should be uniform from end to end.

One of the main points of advantage in the use of Indigosols for light plain shades is the dependability, uniformity and levelness of results obtained thereby. Fine quality broadcloth when dyed with Indigosols has a better appearance than one can obtain with vats.

Sometimes when we had a small order, say of 1,000 yards, of a light vat dye, we would use Indigosols and dye it on the jig, and were frequently disappointed the way the dead cotton showed up. When we mercerized the cloth to overcome this defect, and dyed on the jig, the result was not even then what we desired or expected.

Not until recently when I was doing some experiments with Indigosol O4B did I realize the different result one obtained when the same plain cloth was padded and developed, as against dyeing on the jig and developing.

By the jig method, the dead cotton is very pronounced. By padding, it is hardly noticeable. Therefore I suggest that if you wish to use Indigosols, that padding them, if possible, will cover dead cotton much better than dyeing the same cloth on the jig.

PRINTING DIFFICULTIES

While speaking about Indigosol O4B, it might be of interest to tell you about some experiences in the printing of this color.

In the oxidizing of Indigosols to produce the original vats from which they are made, one is confronted with the fact that some are oxidized very easily and some with difficulty.

Indigosol O4B is in the latter class.

In printing this color some plants used neutral chrome and sulfocyanide of ammonia, and as they have good acid ageing conditions and give long enough time, it develops completely in the ageing; but most print works use a stronger oxidizing mixture of bichromate of soda and ammonium chloride, and by this means have complete oxidation in the acid ager, though they only age 4 minutes. But if the time is short in the acid ager and the

color strong, then again incomplete development is the result.

In that event one can still further speed up the oxidation by the addition of one-half to one ounce of chlorate of soda per gallon of printing color, so that the color then comes up completely with a short acid steaming.

At one print works they had trouble with O4B tinting the whites. The formulae I have mentioned did not work as they did at other works. The difficulty was found to be in the drying arrangements.

With can drying any one of the methods would do provided the acid ageing was adequate. In this particular plant they had hot air drying.

With the chlorate in the bichrome formula the color was spoiled and would not come up properly in the ager or by any developing process tried. With the bichrome and ammonium chloride formula the color did not come up evenly as the bichromate was evidently reduced by the organic matter present, because the color could not be developed by passing through sulfuric acid and oxalic acid, but could be developed with nitrous acid.

The steam chlorate formulae using ammonium vanadate will come up whether dried on cans or in hot air. It is not affected by the high temperature of 270° F. in the hot air drier.

It might be of interest here to state that sometimes in trying to print a stronger color one obtains a poorer result, because of the fact that with the amount of chemicals used, salting out of the color takes place. To overcome this, one uses the minimum amount of chemicals and sufficient solvent to keep the color in solution until it gets into the fiber on which it is printed.

While I am speaking of printing, I might mention Indigosol Blue IBC and some of its peculiarities. This is a tetra ether and is very soluble. It easily changes to a diether, which is not very soluble and is of a blue plum color, but it does not change from the diether to the vat color so easily; so in acid ageing it comes out in various stages of development.

Fortunately, this can be easily remedied by passing the printed goods into a bath of cold nitrous acid in the first box of the open soaper, skying somewhat, and then giving a good open soaping.

If the goods are not well soaped and they are exposed to a very hot iron the cloth may be weakened where the blue is printed.

To prevent tendering from inadequate soaping of the Indigosols, one can put 3 lbs. of acetate soda in every 100 gallons of the finish used on the material. This will prevent the weakening of the cloth when exposed to excessive heat.

Indigosol Blue IBC printed with the chlorate of soda and ammonium vanadate formula will come up completely in the acid ager and will need no after development, but if this formula is printed with some aniline blacks the color is affected and a poor result is obtained.

Therefore, if you are printing IBC Blue and have aniline black, as one frequently has in combination with this color, the formula using one-quarter of neutral chromate of soda to one part of Indigosol Blue IBC will need aftertreatment, but will be bright and another advantage of this formula is that the color keeps well and is not affected by the aniline black.

DARK ENDS

Probably some of you may have had trouble when dyeing a mercerized lawn vat color by the pigment pad method of having one end come out darker than the other.

The following method of overcoming this is of interest because with it you can produce a uniform shade in a jig roll, not only on a lawn but on any other kind of cloth that gives you the same trouble, and incidentally has the advantage that there is no vat color wasted after padding, as what is left is used up in the jigs.

We will suppose that you have 100 gallons of color and it is considered all right for shade and strength. Then if a lawn is to be dyed and you wish it to be the same strength on both ends after dyeing, proceed as follows:

If the difference in color has been 33 per cent, as I have seen it, then reduce the 100 gallons with water to 133 gallons. Then pad the jig roll with this reduced color and we will assume it takes 15 gallons for the 1,000 yard jig roll, then make up the jig dye bath with the requisite quantity of hydrosulfite and caustic soda and when the roll is ready to run, add 5 gallons of the padding liquor to the jig dye bath on the first end only and when it is reduced start dyeing and give the usual number of ends to exhaust the color, adding more hydrosulfite and caustic, as usual, at each end.

This reduction of the strength of the passed pad color in the tank and the addition of one-third of the reduced pad liquor to the jig dye bath will make the roll even from end to end. In case of 64x60 cloth or 80x80 cloth the reduction of the 100 gallons of passed color may be to 120 or 110 gallons, respectively, then to the jig one would add 3 gallons of the 120-gallon batch or 1½ gallons of the 110-gallon batch.

The reason behind this procedure is that, that when you pass the padded roll into the hydro bath on the jig, the color between the interstices of the cloth is washed off, and by the time the last of the padded roll has entered the jig the liquor in it is a quite strong vat, and as this last end also comes back first, this end is exposed to a strong vat; whereas the first end goes into the jig containing no color, and as it comes back the jig vat color is considerably weaker than when the roll began to return on the second end, hence the much stronger color on one end than the other.

The other day when I was telling a dyer about how he could remedy a Fast Red G which had been dyed and which showed dead cotton, he told me how he did it with vat colors.

He runs the vat colors continuous to obtain part of the shade, then he dries it and dyes it to shade pigment pad method. By this means he makes a better looking job.

Here is a sample of cloth mercerized after dyeing Napthol AS Red. Such treatment makes what sometimes might be a second into a first.

CARBITOL

An experience with Carbitol may be of interest to some. I was in New York one day and as I walked into the laboratory one of the workers said, "We cannot do anything about this, Mr. Verity, can we?" I said, "What is it?" A screen printer had brought in a sample printed with a Pharmasol Blue, and it showed a light mark where there was a double thread, and I noticed also that the navy was a little uneven in places, so I said, "Try printing it with the addition of 5 per cent Carbitol." About an hour afterwards I asked, "Where is the screen printer?" They said he was so well pleased with the result that he had quickly picked up his things and gone back to the screen printing plant. Carbitol is an excellent levelling and penetrating agent.

DYEING RAYON

Two years ago I was in Pennsylvania and had a very interesting experience. We had some spun rayon material to dye and I matched the shades by the spot patch method. When I went down in the dyehouse to see how they were getting along, much to my surprise they were padding the wet padded roll through the same color a second time. I asked the reason why. The workman said they thus padded all their goods, direct to the nip, batched up, and repadded, the face of the goods being run in the reverse position the second time.

This was the only procedure by which they could dye sateen striped curtain material satisfactory to the trade.

I said, "What difference does the twice padding make to the strength of the shade?" He did not know. "Will you run me 5 yards once through and develop it with the bulk of the goods twice through?" "Yes, I will be glad to do so." Here is the result:

The twice padded fabric is about double the strength of the once padded material.

Delustered rayon gives a similar result and here are some shades done that way, which you will see are perfectly level and alike in strength on both sides.

If any of you have to dye this material the following details may be of value. After padding to the nip, batch up, using a rubber covered expander to keep out the scrimps, and batching up with as little tension as practical to keep out the scrimps. Do not touch the padded roll, handle by the shell only, and when you develop the color in the jig put the roll up on the jig so that the cloth will run into the acid without touching any bar or roller. Then batch up in the jig in the regular way, and the rest of the process as usual.

Pressure in any form on the roll before developing will press the color from one side to the other and cause an uneven appearance on the developed cloth.

I wish to mention some other interesting processes of rather recent development. One is the dyeing of viscose in the bulk while it is being spun. This gives a levelness of result that is only possible by this method. Flesh tints for undergarments are produced by this method in a large way in Europe.

Another is the dyeing of Bemberg and spun rayon by the so-called Unipan method.

It is a one bath method used on goods that must be handled as little as possible. Here are samples of spun rayon and Bemberg dyed in this manner on a winch machine. Some Indigosols are more suited for this process than others.

Another recent development of the use of the Indigosols is a resist method, by which these shirtings were done in this country. This style is employed in several countries in Europe.

The white resist and vat color is printed on the white cloth, vat aged, dried, then padded, and developed in Indigosol colors, washed and rope soaped.

Protection of Wool Fiber

During Scouring and Dyeing*

R. A. LINDENMAIER**

SPEAKING on the protection of wool during scouring and dyeing, it is probably correct to make the statement that the best protection consists in proper handling. Proper handling includes processing only in such a way that the tensile strength of the fiber and its appearance are in no way harmed. It also includes avoiding contact of the fiber with any substances that are liable to interfere with the tensile strength or the appearance. The first consideration is mainly a mechanical question, that is, good machines ought to be used and kept in good condition. The question of substances which are liable to interfere with the tensile strength or the appear-

*Presented at meeting, Northern New England Section, November 4, 1938.

**Sandoz Chemical Works, Inc.

ance is chiefly a chemical one. The main substances in this respect are:

Acid
Alkali
Chlorine

Bacteria, such as mildew, moths

Furthermore, the influence of heat and light upon the wool fiber is of great importance. In order to make sure that the chemical side is in order most firms have pH control as well as temperature control. Steps are also taken to avoid sudden changes in temperature. If the fiber is subjected to a cold treatment immediately following processing at a high temperature, contraction takes place which interferes with the fulling qualities of the fiber.

In the DYESTUFF REPORTER of October 19th comprehensive information has been published regarding the detection of faults on wool caused either by excess of alkali, acid or by exposure of the wool to too high a temperature. The object of this paper is more to suggest means to avoid occurrence of such faults.

Where it is a question to finish the goods in such a way that they will show as perfect an appearance as it is practically and commercially possible, the moisture content of the wool fiber plays quite a part. This has been described in detail in the *American Wool Handbook*. From the details mentioned in the Handbook it clearly appears that overdrying at any stage of manufacture is detrimental. The wool will only show the best possible finish if it has been dried at a comparatively low temperature and is then allowed to regain its natural moisture content. To illustrate the fact that a considerable amount of attention is being paid to this point it might be mentioned that firms in England finishing high grade woolen piece goods take as much as four days for the finishing operation. The goods are allowed to pick up the natural amount of moisture from the atmosphere in between every stage of finishing.

Regarding the effect of sunlight, the most important point to be considered here is the fact that due to the influence of sunlight the sulfur group is transformed into an acid. It is only natural that when dyeing wool that has been exposed to sunlight for a prolonged period this wool will have an increased affinity for acid dyestuffs. In order to illustrate this point tests have been prepared for this meeting showing light woolen overcoating which has been faded in sunlight. The wool has then been redyed with acid colors and shows clearly a heavier shade on the faded portion. The third dyeing has been made in the presence of two parts Levana per 1000 parts dye liquor to act as a leveler. You will see that the fade can still be detected, but the action of the level dyeing agent is quite pronounced. Looking at the problem from the point of view of protecting the fiber it is obvious that undue exposure of the goods to sunlight has to be avoided.

Considering the effect of steam and water, very little trouble can occur on condition that the temperature is kept within the standard limits accepted for wool. Commercially the effect of water and steam on the fiber is being used to produce the "set" by steaming in hot water under pressure. The pressure is not released until the goods are cooled off with cold water and the swelling and finish obtained in this way is permanent until the goods are exposed to higher temperatures than the steam used in finishing.

Examining the effect of alkali, we know that when treating the wool in excess of alkali a portion of the sulfur in the wool is converted into a more stable form and the remainder into an unstable form which breaks down further giving off hydrogen sulfide. According to information published in the *American Wool Handbook* mentioned before it is perfectly satisfactory to scour raw stock for 10 minutes at 130° F. in 3 grams soda per liter at a pH of 11. When keeping within these limits it should be possible to produce as good a fiber in every respect regarding strength and appearance as can be produced under practical conditions.

Chlorine has a very marked effect on the wool fiber, destroying its felting properties. This is being exploited in the production of unshrinkable wool; this is not the place to enlarge further on this subject. It should be mentioned, however, that wool which has to be fulled in its subsequent stages should not come into contact with chlorine in order to insure the best finish.

The above mentioned points if watched carefully should be sufficient to produce the best protection under normal conditions on medium and better grade goods. The developments, however, which have taken place recently in marketing cheaper goods, both ladies' and men's wear, also the bringing out of many designs with raised patterns or open weaves, necessitate special precautions. In order to take care of these increasing demands, the Sandoz Chemical Works are marketing under the names Lanasan and Levana protecting agents which can be used in acid, neutral or alkaline baths. These protecting agents have the purpose of acting as buffers in the scouring and dyeing baths, counteracting the pressure, the influence of heat and the effect of acid and alkali.

In order to illustrate some of the cases where materials of this type are useful, samples have been prepared both under practical conditions and in the lab. A set of low quality overcoating materials containing a certain percentage of shoddy was scoured in one case with Lanasan and in the other case with soap and alkali alone. A set of Boucle material of very good quality has been dyed with the presence of Levana as a protecting agent and leveler as against a set dyed without protecting agent.

As can be seen from the samples in question an appreciable amount of protection is obtained from these chemical compounds used in the scouring and dyebaths respectively.

A striking illustration is the effect of one of the Lanasan products in vat dyeing, and samples have been prepared

for the meeting showing this protecting action on two vat colors on raw stock. It is of importance to mention at this point that these tests have not been prepared with a view to suggesting that more vat dyeing on wool should be carried out, but merely as an example for a chemical protecting agent under strong alkaline conditions. Looking at the question from a more practical point of view we can find cases where this protecting action is of greater value, namely hand knitting yarns.

Hand Knitting Yarns

It is obvious that hand knitting yarns have to show as lofty and soft a hand as possible and, therefore, maximum protection is advisable.

Shading and Stripping

In many cases it is not possible to obtain the right shade in the shortest time when color adds have to be made and the goods run for extra time the additional strain on the goods often makes the difference between a really good article and only fair results. In a case like this a useful purpose is served by a protecting agent in the dyebath. The conditions are even more severe for the cloth where stripping and redyeing has to be done and, therefore, in the latter case the action of the protecting agent is even more beneficial.

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PROGRAM NOTICE
Inter-Society Color Council

THE Inter-Society Color Council, of which this Association is a member body, will meet in New York City on February 23, 1939, in the auditorium of the Electrical and Gas Association of New York, 480 Lexington Avenue.

The meeting will be held during the week in which the Technical Association of the Pulp and Paper Industry and the Optical Society of America, two member bodies of the Council, hold meetings in New York City. The complete program will be announced in the *Bulletin of the Physical Society,* since we meet jointly with the Optical Society of America and the American Physical Society (Columbia University, February 24 and 25).

All members of the A. A. T. C. C. interested in color are invited to attend the sessions. Official delegates are urged to be present.

MORNING SESSION

9:30 A. M.—Business Session

To include reports of committees, particularly the report of the Problems Committee, Dr. Deane B. Judd, Chairman.

Reports from the chairman of delegates from each member body will be requested. They should be in writing, to be included in the report of the meeting.

AFTERNOON SESSION

2:00 P. M.—Technical Session on Color Tolerances

This meeting is sponsored jointly by the Inter-Society Color Council and the American Psychological Association.

Chairman: FORREST LEE DIMMICK, Hobart College

The Physics of Color Tolerances. Deane B. Judd, National Bureau of Standards. The physicist evaluates color differences operationally in a standard coordinate system; perceptibility of color difference is relatively unimportant in tolerance consideration.

The Psychophysics of Tolerances. Edwin G. Boring, Harvard University. The fundamental significance of the psychophysical methods and techniques in the evaluation of small sensory differences.

The Ratio Method in the Review of the Munsell Colors. Sidney M. Newhall, Johns Hopkins University. A promising application in a different field of a psychological method which is being used in color tolerance determination.

Color Tolerances as Affected by Changes in Composition and Intensity of Illumination and Reflectance of Background. Harry Helson, Bryn Mawr College. Typical data illustrating lawful relationships between the hue, saturation, and lightness of surface colors and principal conditions of viewing.

Representation of Color Tolerances on the Chromaticity Diagram. David L. MacAdam, Eastman Kodak Company. The ICI coordinate system is recommended for color tolerance representations; use of a coordinate system based on just noticeable color difference data would be unjustified and misleading.

Specification of Color Tolerances at the National Bureau of Standards. Deane B. Judd, National Bureau of Standards. Color tolerances have been applied by (1) specification of a mixture diagram, (2) use of a standard tolerance and sample, and (3) use of the "NBS unit of surface-color difference."

Industrial Color Tolerances. Isay Balinkin, Cambridge Tile Manufacturing Company, Cincinnati, Ohio. Techniques and results in the establishment of color tolerances for particular products and purposes, and with special reference to ceramics. Control of color uniformity by determination of rates of color variation as a function of various physical or chemical factors.

There will be an exhibit of color tolerance problems in connection with the afternoon program.

8:00 P. M.—Popular Session: Parade of Color

Each member body has been invited to contribute a short demonstration of recent color developments or a research project of outstanding importance to his society, the presentation to be made in a popular manner.

The purpose is to illustrate the color interests of each of the member groups. By so doing, the need and importance of the Council will be dramatized, and the realization created that many color problems can be solved by mutual action.

The names of all the speakers are not yet available.

Tickets must be obtained for this session. They are available without cost from the Council Secretary, Dorothy Nickerson, Bureau of Agricultural Economics, Washington, D. C.

MEETING, RHODE ISLAND SECTION

THE November meeting of the Rhode Island Section was held on Monday evening, November 21st, 1938, at 8:00 P. M. at the Providence Engineering Society Rooms, 105 Angell St., Providence.

The meeting was presided over by chairman Richard Haworth, who announced the program for the National Convention to be held in Atlanta on December 2nd and 3rd.

A sound picture, "Keeping Nature on the Course," sponsored by Hiram Walker, Inc., was shown. The narration was by Lowell Thomas and the film showed the interesting distillation control.

The two speakers of the evening were Mr. Hector C. Borghetty, M.S., of the Textile Chemical Division of the General Dyestuff Corporation, and Mr. Dave E. Truax, S.B., Chemist for the Stein Hall Company. Their subjects were, "Preparation and Finishing of Textile Fabrics," and "Stability of Printing Pastes," respectively.

Respectfully submitted,

LOUIS D. FLEMING.

LAPEL BUTTONS

A new supply of lapel buttons in 10 Kt. gold, bearing the seal of the Association, is now ready. Orders from members in good standing, accompanied by price of $1.50, may be addressed to the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. Please make checks payable to "Secretary, A.A.T.C.C."

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ON THE COLOR TECHNICIAN'S SIDE

OCCASIONALLY an unsung means of livelihood to sons of toil emerges from the shadows and takes a bow. Mayhap the bow is unnoticed, unsolicited, unwarranted. And then, having with some apprehension made its bid for a glance of recognition, it slips quietly back to, perhaps grateful for, the shade of seclusion.

"Men of the shadows" are to be found in every kind of industry. Some come under the classification by design, obscurity sometimes having its rewards. On the other hand, many a man whose life work lacks a musical score, is so situated by the very nature of things. His position in the scheme of things is so far removed from the ultimate product of all contributing factors that any glory resulting from his efforts is spent long before the effect of those efforts is carried to a conclusion. The color technician, a spoke in the textile wheel, is placed in the second category.

But let him hasten to say that he is not complaining. His best work is done beyond the walls of seclusion and, despite a failing common to all humans, the taste for a bit of glory, a little importance, he is in the work as a source of sustenance. His job is fairly remunerative, too, varying of course with experience and ability. Certainly his job is not dull or devoid of variety. On the contrary, the problems which confront him in his daily assignments are wide and diversified. This is particularly true of the technician in the service laboratory of a dyestuff manufacturer. To this man who has been classed as dead-wood, non-productive—just an ordinary fellow, come problems embracing the application of every known class of dyestuff to every known type of textile fiber, paper, leather, furs, wood, plastics, food products and practically anything to which color will lend style, make more desirable and saleable.

We all know to what extent color goes in making up this life of ours. We cannot open our eyes except in total darkness without observing color in some form. Mother Nature is, of course, the Master Color Blender. But the color technician, even Mother Nature would admit, does a fair job in the assistance he renders the fellows who apply color commercially and in the control he maintains over the dyestuff makers' products.

Trade requirements are such as to demand constant improvement of established colors and the development of new ones. These products, rightfully the pride of the producing chemist, before reaching the consumer are turned over to the application laboratory. Here they undergo rigid inspections as to tone and clarity of shade, strength, solubility, dischargeability, fastness properties, etc., particular stress being placed upon the requirements for which they are intended. Needless to say, should one phase of these inspections fall down to the disgust and expense of the consumer, the color technician is called to account. Naturally he is quick to condemn anything new which fails to measure up, thus risking the wrath of the plant chemist. A plant man thus disappointed once said to a technician, "We fellows labor to build up a beautiful product, then you twerps proceed to tear it down." The reply came, "Love is a beautiful thing, but it takes two to prove it."

Seldom is a single feature of a new product overlooked, but it does happen. Perhaps months after the color has gone into production a new angle of value is discovered. A case in point is exemplary.

In response to the demand for a bright, acid dyeing orange, fool-proof in levelling quality and surpassing known types of light fastness, the research department set to work on the problem. After many trials, with the cooperation of the application laboratory, the demand was met and to the trade was offered a new color without prototype. Under pressure of other matters and since requirements had been covered, an excellent property of the new offering was overlooked. From a consumer source came the information that the color had been adopted because of its sea-water fastness. A recheck verified the report.

Now, these were extenuating circumstances for the technician staff. In consequence, using the vernacular, everything was "Jake." However, had a high rating to sea-water been assigned without foundation in fact,—well, "Jake" might have been missing.

At this point the reader, if there be one, has gathered that the individual guiding the pen is a member of the profession under discussion. To which he confesses. It may be felt that he seeks to build up the importance of his job or to call attention to some imagined grievance. Be that as it may, his real purpose is to resent and to challenge the charge that the men in his field are a lot of dead-wood, non-productive—just ordinary fellows. The imputation, made by one who enjoys a place of prominence

in the industry, has long rankled in the mind of the writer. Now, these lines are strung together in rebuttal; for the purpose of presenting a word picture of the color technician. What he's like and what is required of him.

A pre-requisite to success in color technology is freedom from color-blindness, a deficiency first noticed and within himself, by John Dalton, an English scientist of the early 19th century. In this connection it is noteworthy that the extent of impaired color vision among humans, while not overwhelming, is nevertheless startling. It is estimated that three per cent of males and about two per cent females in the civilized world population are totally or partially color-blind.

Another requirement is color-sense. This essential seldom comes naturally, cannot be taught but may be slowly acquired by dint of hard work and strict application to the job. Of course, as in other fields of endeavor, certain rules apply which serve to guide the individual to his respective goal. But the acquisition of a color-sense may be likened to the successful operation of an automobile. The beginner at the wheel may quickly learn from descriptive literature, the various essentials to successful automobile driving. He cannot, however, be instructed to judge distances in relation to the speed at which he is travelling in order to avoid an accident or as to just what to do under a given set of circumferences. Getting the "feel of the wheel" is a slow process of practice just as is the development of a color-sense whereby, over a longer period of time of course, the color technician slowly arranges in his mind the entire outlay of colors, their relationship to each other and the many possibilities in their blending.

While the color-sense is in process of development, the aspirant to success in the field necessarily and thoroughly familiarizes himself with all types of coloring matter, the many materials and substances to be dyed, the innumerable methods and assistants effecting their unions and the manifold, complex means of recognizing each.

All of this, it would seem, sums up to a form of work calling for some horse-sense, initiative, observation and a definite steadiness of purpose over a period of years.

WILLIAM D. BAIRD

TECHNICAL NOTES FROM FOREIGN SOURCES

Some Methods of Rendering Wool Non-shrinking

Fritz Guenther—Monats. f. Textil-Ind. 53, 81 (1938).—Up to very recently there have been two methods practiced for protecting woolen goods against shrinking, each method consisting in chloring the wool; treating the wool either with gaseous chlorine or with sodium hypochlorite; either method producing the same type of fiber, and unavoidably involving some oxidation of its substance. The ideal has been, to produce ultimately woven goods which will not shrink at all when wetted, and which have not suffered any loss in strength through the processing used. To attain 100 per cent of non-shrinking quality naturally implies such vigorous treatment that there is always great danger of weakening of the fiber. The most recent agent employed for the chloring is sulfuryl chloride.

At present, the problem has become strikingly simplified in one direction. With the recent growing use of Celta in mixture with wool, the new mixed material, with all of its other advantages, is of itself less liable to shrinkage than wool alone; since the Celta is non-shrinking, its presence in the mixture more or less compensates the shrinkage which the wool component may undergo. Accordingly, in such material, it matters much less if the wool component does shrink slightly, since the absolute shrinkage is less to start with, and this is further controlled by the non-shrinking Celta component.

The chloring of wool by means of hypochlorite solution is the method most used. It consists in treating the wool in a hypochlorite bath of about 1 to 4 g. of active chlorine per liter for about ¾ hour in the cold, souring with a dilute sulfuric acid bath, washing thoroughly, and then treating in a 10 per cent bisulfite bath as an antichlor, finally washing well again. To impart a good feel to the wool, a final bath containing some softening agent is advisable, for the chlored wool is likely to come out hard and brittle. Occasionally one works in an acidified hypochlorite bath; in this way it is easy to reach an absolutely non-shrinkable result; but the danger of tendering the fiber is much greater.

In chloring by means of gaseous chlorine, the chief requirement is that of suitable large chambers, in which the wool can be spread out for easy access of the gas, and which can be (and must be) capable of being perfectly sealed to prevent escape of chlorine, with the attendant dangers to the health of the workmen. The material may be loose wool, yarn, or weave. The treatment after chloring is the same as before washing, bisulfite bath, washing). It is claimed that this method imparts additional desirable spinning properties to the loose wool. This method can hardly displace the hypochlorite method, since the first outlay for the necessary chambers will be great.

These two methods are the ones generally practiced, the wet method principally. The chloring of wool not only affects its felting and shrinking properties, but also modifies its dyeing properties. The more complete the action, the greater the affinity of the wool for dyestuffs. This goes hand in hand with the progressive weakening of the fiber; the deeper the dyeing, the greater the extent to which the wool fiber has been tendered. Over-chloring frequently destroys the scale-structure of the fiber, as is well known.

Hall has devised a third method of chloring wool, consisting in the use of a solution of sulfuryl chloride in an inert organic medium, such as benzine, carbon tetrachloride, or trichlor-ethylene. The sulfuryl chloride amounts to about 2 per cent of the weight of the wool, and the treatment lasts for about an hour at the ordinary tempera-

ture. The concentration, temperature, and time-factor may be altered as desired, except that excess beyond a certain point, with any of the factors, is likely to tender the wool. After treatment, the wool is centrifuged, and the liquor recovered; the wool is finally washed thoroughly. The wool does not need to be scoured before chloring in this way, since the organic medium takes care of this point. The danger of tendering by this process is not as great as in the two previous methods.

The process requires the careful recovery of the organic medium, which means the employment of properly cased centrifuges, storage tanks, and, with the quantities of wool-grease accumulating in solution with the use of unscoured wool, apparatus for rectifying the solvent and recovering the wool-grease also.

It is claimed that more perfect non-shrinking properties are imparted to the wool by this method, than is the case with the other two methods; and therefore less of the chloring agent is needed to produce a given result.

The hypochlorite method is at present in control of the field, the chlorine-gas method being used here and there. The third method has its own way to make, and its progress will be watched with interest.

Contributions to the Theory of Acid Wool Dyeing (VI)

Dr. W. Ender and Dr. A. Mueller—Mell. Textil-Ber. 19, 65 (1938).—The substitute title of this section of the paper (which has been repeatedly noticed in these columns), reads "Regarding the Course of Reaction in the Dyeing of Wool with Palatine Fast Dyestuffs."

The dyestuffs marketed under this name are acid wool dyestuffs which contain chromium in a state of complex attachment—as a class, the Palatine Fast and the Neolans, which are similar, are well known representatives. As the views prevalent regarding the manner in which such dyestuffs become attached to the fiber are widely divergent from each other, it was considered that this special class of colors deserved special study.

This group of colors is in general distinguished by the following facts: when dyed under the conditions usual for acid wool dyestuffs, they do not dye level; level dyeings require a larger percentage of sulfuric acid in the bath, and sometimes special levelling agents are needed also. The dyeings, as a result of the presence of chromium, are considerably more fast to water and washing, besides possessing certain other desirable properties. This additional fastness led the authors to believe that the chromium component of the dyestuff takes its part in the chemical anchoring of the dyestuff molecule to the fiber. This belief underlies the present study.

The experimental work was carried out in this case, as in those taken up in the preceding papers, with the dyestuffs in the form of the free, pure dye-acids. Colors were chosen which contained one atom of chromium per molecule of dyestuff. The dyestuffs studied (as dyestuff acids) were the following:—

1—Palatine Fast Blue GGN ....2 sulfo groups
2—Palatine Fast Violet 5RN...2 sulfo groups
3—Palatine Fast Bordeaux BN .2 sulfo groups
4—Palatine Fast Pink BN ....2 sulfo groups
5—Palatine Fast Blue BN .... 1 sulfo group
6—Palatine Fast Violet 3RN ...1 sulfo group
7—Palatine Fast Yellow GRN..1 sulfo group
8—Palatine Fast Orange GEN..1 sulfo group

The same method of study of the acid character of the dyestuff acids of these colors as was used in the study of the common acid azo dyestuffs, by construction of a titration-curve, was employed also in the present case. A graph is given for one, Palatine Fast Bordeaux BN (potentiometric titration with an antimony electrode); only one is given, as the curves of the other dye-acids are quite similar to the one given. The graph shows a sudden flex at a pH value of 5-6, and proceeds beyond this point more smoothly, indicating that the two sulfonic groups in the case mentioned exert their action in different degrees; that the presence of the chromium (forming a basic chromium-complex) causes the dyestuff-acid ion to act as a "zwitter-ion," with an excess sulfonic group, as, for example, the reaction of an acid salt of a strong acid with a weaker base. The greater the degree of dissociation of the acid, and that of the basic group, just so much greater is the hydrolysis of the "inner salt."

The dye-acids containing two sulfonic groups were more easy to study than those containing only one such group, the latter being considerably more difficultly soluble in water; for example, saturated solutions of the dye-acids of Palatine Fast Blue BN and of Violet 3RN contained only about 1.7 and 0.3 g. of the acids per liter, respectively, that is, in the case of the former, the solution was 1/3000 N, and in the case of the latter, 1/1600 N. Exact titrations in such cases were practically impossible.

The Palatine dyestuffs are evidently amphoteric substances, like wool itself; the chromium "group" is a monovalent basic group. These evident facts are the source of difficulty in investigation of the reactions which go on in the dyeing process. Up to the present, the authors have shown that the dye-acid attaches itself to the wool by ionic combination (salt-formation) between the sulfonic groups of the dyestuff and the basic groups of the wool, and by further possibilities in the way of physical adsorption and possibly other chemical unions between other groups which may be present, and about which we at present know too little to be justified in speaking of them too definitely. To these methods of attachment must here be reckoned others also; for example, salt formation between the basic chromium-complex of the dyestuff, and the carboxyl groups of the wool (so-called heteropolar ionic unions), and also a possible formation of a complex between the dye-acid-chromium complex and the wool (a homoeopolar or co-ordinate union).

All this necessitated an examination of the method of study previously followed, to see whether it would be equally satisfactory in the case of the Palatine Fast colors.

In a previous paper the authors showed that with ordinary acid wool dyestuffs the gravimetric method for determining the amount of dyestuff-acid taken up gave good results. The same method was therefore employed in the present case. Details are given, and a graph showing the rate of absorption. This rate is very slow with the Palatine Fast colors containing a single sulfonic group, slower than that of the acid wool dyestuffs (fulling dyestuffs) which go upon the fiber slowly; although the molecular weight of the Palatine Fast dyestuffs is not greater, in general, than that of many dyestuffs which go upon the fiber much more readily. The Palatine Fast colors which possess two sulfonic groups go upon the fiber rather more rapidly, and do not differ much in this respect from some ordinary acid wool dyestuffs, such as Fulling Red G, or Acid Anthracene Red G, which go upon the fiber rather slowly.

Valkó has carried on studies upon the diffusion-rate of the free dye-acids of ordinary and Palatine Fast dyestuffs, and has shown that the condition of aggregation of the Palatine Fast colors, at a pH range of 5.5 to 1.3, lies between 1 and 2, on the average at about 1.2. The degree of aggregation of the Palatine Fast colors is hardly greater than that of the common acid wool dyestuffs, such as Orange II or Azo Grenadine S. Chrome Blue GGN, which behaves like a normal acid dyestuff, showed an aggregation-value of 2.4. Valkó therefore assumes that the special sort of behavior of the Palatine Fast dyestuffs has no relation to the magnitude of particle, and that the part played by the H-ions does not rest upon an influence of the condition of association.

Within the working-conditions maintained, it could not be decided whether or not the absorption of the disulfonic acids of the Palatine Fast colors came to an end at any point. With the monosulfonic acids, it was not possible to decide whether the absorption ceased at any point, or whether it was simply a case of the absorption slowing down to an indeterminably slow rate.

The pH values of the solutions of the monosulfonic acids were rather high, because of the "zwitter-ion" condition, and the low solubilities of these acids. This may explain the very slow absorption of these acids by wool.

The authors further studied the effect of raising the pH concentration upon the rate of absorption. Graphs are given illustrating the results. They show that, by lowering the pH value by addition of HCl, there is in some cases no alteration of the rate, and in other cases, especially with the disulfonic acids, a distinct increase. The higher pH value of the solutions of the dye-acids of the Palatine Fast series is therefore not the cause of the monosulfonic acids going upon the fiber more slowly than the disulfonic acids. The authors expect to deal with this matter further.

In the portion of the paper which deals with the amount of dyestuff-acid taken up by the wool, interesting values are given. It may be concluded that the amount of sulfuric acid taken up diminishes as the dyestuff-acid goes upon the fiber, a result found also in the case of the common acid dyestuffs. The sum of the equivalents of dyestuff-acid and of sulfuric acid does not correspond with the normal acid equivalent of wool, 0.080 to 0.085 g.-equivalents for 100 g. of wool. With the monosulfonic acids, the sum of the equivalents diminishes as the amount of dye-acid taken up increases. The same fact holds true for the disulfonic acids, if one calculates the dye-acid equivalent on the basis of only one *free* sulfonic group. If the disulfonic acids are regarded as dibasic acids, the equivalents gradually increase, in some cases far beyond the normal acid-equivalent for wool.

If the dye-acids exist in solution as "zwitter-ions" (e.g., monosulfonic acids reacting neutral, or weakly acid, as a result of hydrolysis) and if they also go upon the wool, as the common acid wool dyestuffs, only through the sulfonic group, with formation of a difficultly hydrolyzable (irreversible) salt, then the basic chromium-complex group must be "free." For each basic group of the wool which, as a result of salt-formation with the sulfo-groups of the dye-acid, disappears from the region of possible activity, there appears another basic group, the chromium-complex group, in opposition to which no sulfonic group in the dye-acid molecule, as an anion, any longer is available. In dyeing with the disulfonic Palatine Fast colors, two basic groups of the wool are reacted with by one of these basic chromium-complex groups, if the sulfonic groups of the dyestuff react with the basic groups of the wool with the presumable formation of the difficultly hydrolyzable wool-dyestuff-acid salt.

According to this view, the acid-absorptivity of wool dyed with Palatine Fast monosulfonic acids, by after-treatment with N/10 sulfuric acid, should remain unchanged, similarly to that of undyed wool. This same value for wool dyed with the Palatine Fast disulfonic acids would have to diminish from about an 0.085 g.-equivalent (calculated upon 100 g. of wool) until, on complete saturation of the basic groups of the wool, it reached the half of this value. Also, the sum of the dye-acid and sulfuric acid equivalents would have, with the monosulfonic acids, to rise to a maximum of 0.170, and with the disulfonic acids to about 0.128, at complete saturation of the wool. It is unfortunate that these conclusions, based upon the assumption that the Palatine Fast dyestuffs unite with the wool by only one sulfonic group, could not be confirmed. The sum of the equivalents does not rise above 0.085 if one regards the Palatine Fast disulfonic acids as dibasic acids. But it is not easy, as yet, to characterize the results obtained.

The Palatine Fast dye-acids, then, behave in a way different from the behavior of the common acid wool dyestuffs, in which only the number of sulfo-groups of the dye-acid, or the number of basic groups of the wool, controls the quantitative course of the dyeing; that is, where the sum of the equivalents of dye-acid taken up, and of sulfuric acid, must remain constant.

* * *

This section of the paper is continued on page 181 of the succeeding, the February issue, this second part being a more extensive study of the monosulfonic Palatine Fast

colors, namely, Palatine Fast Blue BN, Palatine Fast Violet 3RN, Palatine Fast Yellow GRN, and Palatine Fast Orange GEN.

From the observation that, after dyeing upon wool with these monosulfonic acids, the combining power of the wool toward acid is decreased, the authors conclude that the chromium is somehow involved in the attachment of the dye-acid to the wool. For this sort of union, there is more than one possibility: thus, for example,

1—salt-formation between the basic chromium and the carboxyl groups of the wool,

2—formation of a complex between the chromium and the wool,

a—the amino-groups being also involved,

b—other groups in the wool being involved.

As to 1, it must be admitted that this sort of union is possible. But at a pH concentration such as is present in the after-examination with N/10 sulfuric acid, the carboxyl groups are only slightly ionized, while the monobasic chromium in the dyestuff-complex is completely ionized; the titration-curve for the Palatine Fast colors proves this. Therefore, in the after-treatment with N/10 sulfuric acid, the chromium must still unite with sulfuric acid; that is, the acid-absorptive power of the dyed wool should not diminish so strongly as it has been observed to do.

Since this salt-formation between the chromium and the carboxyl groups must be considered as not taking place, one of the alternatives, a or b, under 2, must be examined. In the case of the monosulfonic acids, two basic groups of the dyed wool can no longer be detected when one molecule of the dye-acid has been taken up. The almost neutral zwitter-ion of the monosulfonic acids therefore appears to act as a dibasic free acid. If the equivalents of the dye-acid taken up by the wool are so brought into calculation that we treat them as involving a dibasic acid (without the interference of basic chromium), then the sums of the dyestuff acids and sulfuric acid remain constant, and again come up to the normal acid-equivalent of wool. Only Palatine Fast Yellow GRN behaves anomalously in this respect; appearing to react as a monobasic free acid (without basic chromium).

A table is given at this point, showing the time of dyeing, the sum of the equivalents, and the equivalents based upon the assumption of a monobasic acid (this last only for Palatine Fast Yellow GRN).

The figures of the table make it plain that a complex union does take place between the wool and the dye-acid, and that, in the process, a part of the total of basic groups of the wool-dye-acid compound, possibly also of the previously basic chromium, loses its basicity (recession of dissociation). It is beyond doubt that basic groups of the wool take part in the formation of the complex wool-chromium-group dye-acid (the final dyed-wool compound); and this confirms the assumption of Valkó, that the chromium forms a firm "bridge" between the keratin molecule and the Palatine Fast dye-molecule, in dependence upon the new theory of tanning (including mordanting) developed by Gustafson, and by Kuentzel and Riess. The authors give a schematic illustration of ways in which the union between wool and the Palatine Fast dyestuffs (the acids) may be conceived of as taking place. Of the three possible ways illustrated, no one can at present be selected as the probable one—it is certain only that the basic groups of the wool do take part in the formation of the complex.

The basic groups of wool are, however, not all equivalent, and probably cannot, all of them, play their part in the formation of the complex, in the same way. If only a certain part or proportion of all of them is capable of such a union, then the absorption of dye-acid must cease before all the basic groups have reacted; or else the amount of Palatine Fast dye-acid absorbed after this point must become attached to the wool only by means of its sulfo-groups (simple salt-formation). With this coincides the observation that the Palatine Fast monosulfonic acids (without "free" sulfonic groups) react with only a relatively small proportion of the basic groups of the wool, and these do not (apparently, at least) go upon the fiber further; while the Palatine Fast disulfonic acids do go upon the fiber distinctly more strongly.

The authors further examined more closely two dyestuffs, Palatine Fast Blue GGN and Palatine Fast Violet 5RN, containing each two sulfonic groups; dyeing them in the most varied percentages, and determining the amount of dye-acid and sulfuric acid absorbed, as before. A graph is given of the results from each of the dyestuffs. The abscissae show the amount of dyestuff taken up in g-equivalents (per 100 g. of wool), the ordinates the sums of the dyestuff-acid-sulfuric acid equivalents. Each curve sinks at first, then proceeds horizontally, and the sums of the equivalents remain constant. The graphs show that the disulfonic acids, in their reaction with wool, at first saturate more basic groups than would be the case if they were reacting as common acid dyestuffs, setting up a salt-union between the sulfonic groups of the dyestuff and the basic groups of the wool. Again, it is plain that with the Palatine Fast disulfonic acids the same complex-union is set up between the chromium complex and the basic groups of the wool, as has been found to be the case with the Palatine mono-sulfonic dye-acids. This formation of a complex, however, comes to an end at a certain point, and beyond this limit the disulfonic acids go upon the wool as simple acid dyestuffs, by means of the one "free" sulfonic group. The proportion of basic groups of the wool which react is not always the same, but naturally varies with the dyestuff, and certainly also, to some extent, with the constitution of the dyestuff.

In practical dyeing, such large quantities of dye-acid are never dyed upon wool, as have been employed in these studies. This point, at which the Palatine Fast dye-acids begin to go upon the wool as simple acid colors, is never overstepped, or perhaps never reached. This point would be at a dyeing of about 4 to 6 per cent of a pure dye-acid, not the dyestuff in pure or diluted (standardized) form,

which in quantity would be much higher than 4 to 6 per cent dyeing. It is therefore true, in practical dyeing, that the method of fixation of the Palatine Fast colors consists, in the first place, in a salt-formation involving the sulfonic groups of the dyestuff and the basic groups of the wool (ordinary acid dyeing up to this point), and that the chromium of the dyestuff then reacts with other basic groups of the wool, with formation of a complex, which further strengthens the simple union. The authors give two important general statements regarding the formation of a chromium-complex:—

1—The amino-groups of amino-acids may be regarded as the groups which can most easily enter a complex union with chromium. A large number of such complexes between amino-acids and heavy metals has been described in the literature.

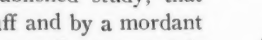
2—The chromium-complex of dye-acids is able to form further more complicated complexes, as shown by the following facts: if one treats chromable dyestuffs with chromium salts in the presence of amines (cf. D.R.-P. 623,347), then, as B. Eistert has shown, there form complex compounds, which contain dyestuff, metal, and amine in mutual union. These compounds may be regarded as "models" of the chromium-dyestuff-wool compounds. Eistert states that the so-called chrome-development process in dyeing is really a process of chroming in the presence of amines (the amino-groups of the wool). Since, in after-chroming dyeings with chromium salts, the chromium attaches itself both to the dyestuff and the fiber (its amino-groups), the resultant dyeing is therefore specially fast—the chromium binds fiber and dyestuff together. When a chromium-pyridine complex containing sulfonic groups is applied to wool, Eistert has shown that the substance does not act like a Palatine Fast color, but as an ordinary acid dyestuff. The free coordination-point of the chromium is occupied by a radical containing nitrogen, and therefore has no affinity for wool; attachment can take place only by ordinary salt-formation between sulfonic groups of the compound and basic groups of the wool.

Kaemmerer has shown, in an unpublished study, that when wool is dyed by a chrome dyestuff and by a mordant dyestuff simultaneously, the mixed tone to be expected is not obtained, but one definitely different. The authors have made some experiments upon the topic, and the paper includes a page of swatches dyed with a Palatine Fast color (Yellow GRN) of 1 per cent depth, and then topped with (a) Chrome Blue GGN from 0.1 to 1.0 per cent, and another series with (b) Anthraquinone Violet, from 0.4 to 5.0 per cent. The authors carried out two series of such dyeings, dyeing one set as above, and another set with a common acid wool dyestuff as near as possible in tone to the Palatine Yellow. The first set is the one included as swatches. These two series were then top-dyed with (a) and (b) as above. It was noted that, where the predyed Palatine Fast color was topped with a common acid dyestuff, or a common acid dyestuff dyeing was topped with a chromable dyestuff or another common acid dyestuff, the mixed tones to be expected were obtained. But, when the first dyeing was with a Palatine Fast dyestuff, and this was topped with a chromable dyestuff, the expected compound shade was not obtained, but something quite different, so much so that reaction between the two dyestuffs would have to be supposed. Further experiments merely extended the range of such observations. It must be concluded that the chromium in the Palatine Fast dyestuffs is able to form complexes with suitable substances, among which are the chromable dyestuffs.

(Note by reviewer: There seems to be some contradiction in the above—a Palatine Fast dyeing should not produce an unexpected resultant tone with a common acid dyestuff, but should with a dyestuff capable of being chromed. It may be that an ambiguity of the sort mentioned by the authors, we believe, in a previous part, has unavoidably come about here, because of non-differentiation of terms. What do we mean by a chromable dyestuff? A dyestuff which, after dyeing, may be treated with bichromate, which certainly alters the constitution of the dyestuff by way of quinone formation and this new product than taking on chromium, perhaps, in the basic state? Or does the term mean a dyestuff which is able to take on chromium in the basic state by treatment with a chromium salt (not a chromate), either in the dyestuff state, or as the dyestuff exists in the dyed fiber? It would seem that the authors' statement refers to a Palatine Fast dyeing giving the expected compound shade when top-dyed with an after-chroming dyestuff, which does not contain groups which can take up basic chromium. If this is the meaning, as we suppose, the apparent contradiction does not exist. Certainly, the terms "chromable" and "after-chroming" dyestuffs ought to be used as they are not, in our literature.)

The paper closes with a succinct summary, but, as we have already quoted the conclusions in the course of review, it seems unnecessary to repeat them in closing.

This paper is perhaps the most stimulating and fascinating of the series. It is too bad that such papers have to have an end.



Properties of the Soaps, Fulling Oils and Other Assistants Used in Fulling

A. Rehmann—Monats. f. Textil-Ind. 53, 57 (1938).—An article of highly practical nature, summarizing very definitely the characteristics of the various agents used in fulling, and including several recipes for soaps and oils.

Developed Dyestuffs

Richard Kahl—Monats. f. Textil-Ind. 53, 58 (1938).—A general description, full and good, of the use of the direct cotton dyestuffs for diazotizing and development; with the particular purpose of illustrating the usefulness of some of the more recent German products of the sort; including five swatches of printed goods, with the formulae for the discharges (color and white) employed.

Auxiliary Products For Textile Use

DURING 1935 there was published in the Italian journal, "Bollettino della Associazione Italiana di Chimica Tessile e Coloristica," a series of articles on Auxiliary Products for Textile Use by Egidio Cazzola. The article was lengthy, extending through five issues, but the scientific classification of auxiliary products which was followed appeared to be very complete and satisfactory. We believe it will perhaps serve as a basis for classification and cataloging of the numerous textile chemical specialties which are appearing on the market in rapid succession. The classification follows:

- **ALIPHATICS**
  - A. ACIDS and Derivatives.....
    1. Salts
    2. Sulfated or sulfonated
    3. Esterified with
       a. Alkoxyamines
       b. Hydroxysulfonic acids
    4. Esterified then sulfonated
  - B. ALCOHOLS and Derivatives...
    1. Dispersed, emulsified
    2. Sulfated or sulfonated
    3. Esterified with
       a. Carboxyl-sulfuric acids
       b. Carboxyl-sulfonic acids
       c. Hydroxyl-sulfonic acids
    4. Esterified then sulfonated
  - C. AMINES and Derivatives.....
    1. Amino-salts (hydrochloric, acetic, oleic, etc.)
    2. Alkoxyamines (introduction of alcohols)
    3. Sulfated amines
    4. Quaternary ammonium compounds
  - D. AMIDES and Derivatives.....
    1. Sulfated or sulfonated
    2. Esterified and sulfonated
    3. Esterified and sulfated
    4. Complex Amines
  - E. HYDROCARBON Derivatives .
    1. Sulfonated
    2. Sulfated (starting from a non-saturated member)
- **AROMATICS**
  - A. HYDROCARBON Derivatives .
    1. Sulfonated
    2. Sulfonated Halogen derivatives
    3. Sulfonated Nitro derivatives
  - B. AMINES and Derivatives.....
    1. Sulfonated
    2. Quaternary ammonium compounds
  - C. ACID Derivatives .....
    1. Esterified with
       a. Oxysulfuric acids
       b. Hydroxysulfuric acids
    2. Esterified then sulfonated
  - D. AMIDES and Derivatives.....
    1. Sulfated
    2. Sulfonated
- **HYRO-AROMATICS**
  - A. HYDROCARBON Derivatives .
    1. Sulfonated
  - B. ACID Derivatives .....
    1. Neutralized
    2. Sulfonated
    3. Esterified
       1. Hydroxy sulfuric acids
       2. Hydroxy sulfonic acids
    4. Sulfonated ester derivatives
  - C. AMIDES and Derivatives .....
    1. Sulfonated
- **HETERO-CYCLICS**
  - BASES and Derivatives.....
    1. Pyridine Bases
    2. Quaternary Ammonium compounds

TRADE NOTES • NEW PRODUCTS

• CIBA REVIEW

Copies of *Ciba Review*, Number 16, December issue, have recently been distributed. Featured in this issue is "The Loom" and contents are described by the following titles: The Principle of the Loom; The Loom of Ancient Egypt; Greek and Roman Looms; The Hand-Loom of the Middle Ages and the Following Centuries; The Mechanism of the Loom; Looms of Asia; Weaving as Depicted in Japanese Art; Historical Gleanings; Scientific Notes. Copies are available upon request to Ciba Company, Inc., Greenwich and Morton Sts., New York City.

• GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York City, has released circulars describing the following products:

Chrome Fast Yellow 5 G D—a chrome mordant dyestuff, which is said to be of particular interest for color discharges on both animal and vegetable fibers. The product yields a very bright greenish yellow shade said to possess excellent fastness to light and very good fastness to washing. Circular I.G. 1570.

Brilliant Euchrysine Orange R—a basic dyestuff, recommended by the manufacturers primarily for colored discharges on pure or weighted silk, producing exceptionally bright shades. It is stated that the brightness cannot be obtained by mixtures of other basic colors. It is said to produce very uniform results. The product is also recommended by the manufacturers for application printing on cotton or silk. Circular GDC 153.

• STRETCH CONTROL DURING SIZING

Two new features of the new Johnson rayon warp sizing machine are 1. *A New Stretch Indicator* that shows the percentage of stretch occurring at all times while the machine is running. The mechanism consists of an indicator box, connected by flexible shafts and gears to measuring rolls located at the let-off and take-up ends of the sizer. A patented differential mechanism inside the indicator box automatically records the ratio of stretch or shrinkage on a calibrated dial. Any change in stretch plus or minus, from the predetermined normal is instantly seen by the operator.

2. *Finger-Tip Control*, by which stretch can be kept at the desired point, operated by a knob set close to the stretch indicator box. The knob, which controls the synchronizing of the speeds of quetsch and cylinders, is calibrated to permit indicated changes in stretch down to ¼%.

By the use of these two devices uniform stretch may be realized, without complicated calculations and rule-of-thumb adjustments, and without stopping the machine or making arbitrary, guess-work changes in the synchronizing mechanism. The control is positive and immediate.

The machine is manufactured by the Charles B. Johnson Co., Paterson, N. J.

• ARNOLD HOFFMAN WAREHOUSE

Arnold, Hoffman & Co., well known chemical manufacturers and distributors, with headquarters in Providence, R. I., and branch offices in all major sections of the textile industry, have recently established a warehouse in Charlotte, N. C., to facilitate deliveries in the surrounding territory.

They have also added Stephen J. Hawes to the sales staff of their Charlotte office. Mr. Hawes is a recent graduate of N. C. State University where he specialized in textile chemistry.

• DYESTUFFS

The December issue of *Dyestuffs*, quarterly publication of National Aniline & Chemical Co., 40 Rector Street, New York, N. Y., has recently been distributed. The following articles appear in this issue: A Rapid Conquest, by Dr. J. Arthur Meyers; Dry Color Methods (concluded from September issue), by James E. Loughlin; What Points Should be Considered in Washing? Practical Hints for Preventing Unevenness in Dyeing Mixtures of Wool and Staple Rayon; The Dyeing of Mixed Wool-Lanital Fabrics; Spring 1939 Colors for Women's Gloves, Supplementary Shades—Victorian Pastels; Women's Shoe and Leather Colors for Spring, 1939, Supplementary Shades—Romance Pastels; New National Dyes. Copies of this publication are upon request.

• INDUSTRIAL RESEARCH

Industrial research executives representing the fields of textiles, iron and steel, optical and other special instruments, soap, home appliances, meat packing, chemicals, and others, were represented at round-table meetings of the Industrial Research Institute held at the Engineers' Club, 32 West 40th Street, New York, on Dec. 2-3, Robert B. Colgate, vice-president in charge of research for the Colgate-Palmolive-Peet Co., presided.

Occupying a main place in the discussions, was the subject of research laboratory personnel. The members of the group agreed that it is just as important to know and understand their personnel as it is to know the projects of their laboratories.

• BROOKLYN DYERS MOVE

Brooklyn Yarn Dye Co., Inc., dyers and bleachers of yarns for the knitting trade, has moved this week from 2217 Neptune Ave., Brooklyn, to a larger and more modern two-story plant at 24 Woodward Ave., also in Brooklyn.

In its new location, Brooklyn Yarn Dye occupies over 150,000 square feet, three times as much space as it had in its old plant. Daily capacity is twice as large through the addition of latest type dyeing and drying equipment. Because of the increase in size of the new plant and in the firm's daily capacity, employment will rise substantially, with 200 expected to be employed regularly.

Brooklyn Yarn Dye Co. was organized in 1922 at the Neptune Avenue addresss and has been located there ever since. Officers of the firm are A. J. Stone, president, and Sam Katz, vice-president.

One of the features of the new location is a private railroad siding, to facilitate incoming and outgoing yarn shipments.

• U. S. INDUSTRIAL CHEMICALS, INC.

President C. S. Munson announces that since Jan. 1, 1939, all manufacturing and selling activities of the U. S. Industrial Alcohol organization, with the exception of resins, are being conducted by U. S. Industrial Chemicals, Inc., a wholly owned subsidiary, formerly known as U. S. Industrial Alcohol Sales Co., Inc. This change of name designates more accurately the present nature of the U. S. I. organization's business and reflects also its greatly widened scope in the chemical field. The same organization and plant facilities will continue to serve U. S. I.'s customers as before.

U. S. Industrial Chemicals, Inc., today manufactures widely diversified chemical products and supplies them to virtually every important industry using such chemicals in its processes. The contrast with 1906, when U. S. Industrial Alcohol Co. was organized is sharp. Its sole product then was industrial alcohol. Today the U. S. I. organization manufactures and sells solvents, chemicals, resins, intermediates, anti-freeze, industrial alcohols (pure and denatured), and a vitamin concentrate for stock and poultry feedstuffs.

Upon its incorporation in 1906, U. S. Industrial Alcohol Co. was the pioneer manufacturer of industrial alcohol in this country.

In 1917, U. S. Industrial Chemical Co., Inc., was organized by U. S. I. and immediately entered into the manufacture of acetic acid, acetone, methyl acetate, ethylene, ether and numerous other alcohol derivatives urgently required in the World War by Allied Governments and later by the United States. Today, the U. S. I. organization is one of the largest manufacturers of industrial alcohol and is also a major producer of chemicals and solvents derived from alcohol.

The most recent major step in widening the chemical activities of U. S. I. was its entry into the resin business. Early in 1938 it acquired the business of Robert Rauh, Inc., a leading manufacturer of synthetic resins, including modified and pure phenolics, alkyds, ureaformaldehydes and ester gums. Later in the same year, U. S. I. acquired Stroock & Wittenberg Corporation, well-known importers of natural resins and distributors of synthetic resins. All of U. S. I.'s resin activities are now conducted by Stroock & Wittenberg Corporation.

U. S. Industrial Chemicals, Inc., is beginning the manufacture of cellulose acetate at a new plant constructed for this purpose at Baltimore, Md.

● AWARDED PERKIN MEDAL

Dr. Henri Dreyfus, co-managing director of British Celanese, Ltd., has been awarded the Perkin Medal of the Society of Dyers and Colourists of Great Britain. The presentation of the medal to Dr. Dreyfus will take place on January 19th, 1939, at Bradford, England. The award was made for "Discoveries of work of outstanding importance in connection with the development of the Cellulose Acetate Rayon Industry in England."

The Perkin Medal was struck in commemoration of Sir William Perkin, the founder of the Coal Tar Industry, and is awarded only at intervals of two or three years or more. The medal was awarded only ten times in the history of the Society, and the recipients have all been famous in the scientific field. Those to whom the Medal has been awarded in the past are:

1908—Profs. Graebe and Liebermann, "Synthesis of Alizarine."

1911—Prof. Adolf. von Baeyer, "Synthesis of Indigo."

1914—Comte Hilaire de Chardonnet, "Artificial Silk."

1917—Prof. Arthur G. Green, "Primuline."

1919—Mons. R. Vidal, "Sulphur Black."

1921—Horace Lowe, "Permanent Lustre on Cotton."

1923—Chas. F. Cross, "Discovery of Viscose."

1925—Mons. M. Prud'homme, "Aniline Black and Alizarine Blue."

1928—Dr. Robert E. Schmidt, "For Epoch Making Discoveries of Anthraquinone Derivatives and Dyestuffs Therefrom."

The award to Dr. Dreyfus has interest in the United States because working with him at the discoveries which led to the development of the cellulose acetate rayon industry was his brother, Dr. Camille Dreyfus, president of Celanese Corporation of America and co-managing director of British Celanese, Ltd. As in England, the pioneering work of the brothers Dreyfus led to the growth of the cellulose acetate rayon industry in this country. From a few thousand pounds a little more than ten years ago the production in the United States of cellulose acetate rayon yarns last year was estimated at more than 80,000,000 pounds.

Dr. Henri Dreyfus, with his brother, Dr. Camille, started production of their cellulose acetate in Switzerland, about the year 1910. The bulk of the production was for use in film products and non-inflammable celluloid. Also being produced there was a dope for airplane wings. The brothers in the meanwhile were experimenting in the making of what was then called artificial silk from cellulose acetate.

In November, 1914, Drs. Henri and Camille Dreyfus received an invitation from the British Government to go to England and negotiate an agreement for the supply of cellulose acetate for dope for airplane uses. Following that they established plants for the same purposes in France and Italy. Early in 1918 they were invited by the United States Government to come to Washington and start a similar plant here.

After the war, when the demand for cellulose acetate for airplane uses diminished, Drs. Henri and Camille Dreyfus turned their attention to the production and development of cellulose acetate rayon yarns and fabrics. They negotiated for the plants in England and here and proceeded with the production of their products. Dr. Henri Dreyfus remained in England to direct the work there and Dr. Camille came to the United States to supervise the work at the new plant near Cumberland, Md.

● duPONT RELEASES

E. I. du Pont de Nemours & Company announces release of the following new products: *"Sulfogene" Navy Blue GLR Concentrated*—a new sulfur blue. The fastness properties and general characteristics of this color are very similar to those of the older type, "Sulfogene" Navy Blue GL Concentrated, but the newer type is redder in shade and is also slightly brighter. The new color is recommended by the manufacturers for dyeing cotton in all stages of manufacture, and for use in the same machines in which the GL type is employed. It is said that it presents no application difficulties since it levels well and shows good penetration and exhaustion. It is not suitable for discharging or printing.

"Modinal" ES Paste—a fatty alcohol sulfate which is said to dissolve in hot or cold water to form heavy-bodied, soap-like solutions with excellent detergent properties. It is stated that it is expected to be of especial usefulness in removing solid soil and loose dyestuffs particles to produce brighter fabrics, and impart a pleasing hand to the fabric.

● JOINS AMERICAN MAIZE-PRODUCTS

Mr. Herbert A. Kaufmann, who has been associated with Stein, Hall & Company, Inc., for the past 12 years, will join the production staff of the American Maize-Products Company on January 1, 1939.

Mr. Kaufmann, whose work has previously been primarily in the field of developing technical uses for dextrines and starches, will be engaged by the American Maize-Products organization in the production of such materials.

● NEW HERCULES PLANT

The first step in an expansion program for the manufacture of ethyl cellulose was announced on December 8th by officials of Hercules Powder Company. Work will begin at once on the construction of a new ethyl cellulose plant at Hopewell, Virginia.

At the present time, Hercules ethyl cellulose is manufactured in a plant at the Hercules Experiment Station, near Wilmington, Delaware. Transfer of all ethyl cellulose manufacturing activities to Hopewell will be made as soon as the new plant is completed. The new unit provides Hercules with increased production facilities to keep pace with the growing demand for ethyl cellulose.

According to Mr. M. G. Milliken, general manager of the Cellulose Products Department, Hopewell will prove an ideal location for the manufacture of ethyl cellulose.

Ethyl cellulose, in the opinion of competent observers, is said to be one of the most promising new materials introduced in the United States in recent years. It is used in lacquers, varnishes, plastics, synthetic finishes, textiles, films, paper, and many other products.

One of its most important properties is that it retains flexibility at extremely low temperatures. For example, at the Chemical Show in New York, last year, films of ethyl cellulose were flexed all week over dry ice at a temperature of minus 78.9 degrees centigrade.

Ethyl cellulose is much lighter in weight than other cellulose compounds. It is said to be unusually tough, to resist alkalies and weak acids, to be widely soluble in most solvents, and to be non-flammable. Recog-

nition of these properties by industry is responsible for the construction of the new plant by Hercules.

• COLOR FASTNESS

In a discussion of color fastness and the terminology used to describe it to consumers, A. I. Anderson, Director of Textiles and Research at the American Institute of Laundering, comments as follows:

"There has been talk of a federal trade commission ruling on color fastness and possibly such a ruling is in the offing. If a ruling on color fastness will assist consumers of textiles in differentiating the good from the poor in color fastness, it will serve a needed function. In our opinion, however, there has been no widespread deception in labeling pertaining to color fastness, although a certain amount of consumer disillusionment on color fastness expectation of fabrics could be traced to misinformation from retail clerks.

"Fabrics possessing unsatisfactory resistance to washing and light have been given a 'bill of health' in some instances through the expedient of issuing reconditioning instructions specifying the greatest of precautions to the end that the colors will give some degree of satisfactory performance. There is no need to dwell on this point other than to state that the main function of washing is soil removal, and a sufficient detergency and mechanical action are necessary to effectively remove soil . . . and the dyestuff should be of sufficient fastness to withstand this washing requirement. To establish a performance test with special reference to washing and light, strictly on the basis of dyestuff limitation without considering the conditions of service that the fabric will necessarily encounter, is unjust to the consumer. To give an exaggerated example, if we specify that a certain overall fabric must be squeezed in a warm, not hot, neutral soap solution, followed immediately by rinsing and drying out of the sun for best preservation of color, we have completely neglected to consider the conditions of service the garment will be required to meet. Perhaps the color is preserved through adherence to these directions, but so is the soil.

"Another practice that comes to mind in this consideration of color fastness standards is the disposition on the part of some manufacturers to sidestep the consideration of wash fastness of a fabric simply by specifying that this particular fabric should be dry cleaned . . . even though the type of fabric and the nature of soil that it will accumulate during service necessitates washing as a reconditioning treatment.

"Color fastness standards will require for their establishment not only a conception of the service expectancy of any one fabric, but a realization of the type of reconditioning treatment that will be necessary to restore the fabric after it has been used and soiled. While 'fast color' signifies satisfactory color retention under conditions of wear, washing, and light exposure, we can conceive of different fastness requirements for different classifications of textiles. The light fastness for an awning material would be different from the light fastness requirements of a coat lining. If a federal trade commission ruling on color fastness is forthcoming, what will be the significance of 'fast color' labeling as a guide to consumer purchasing?

"The formulation of shrinkage standards and a standard test procedure was no small undertaking, and even now the matter of application of this ruling to finished garments is not completely understood by everyone . . . particularly since a finished garment cannot be tested through strict adherence to test C.C.C.T. - 191. With color fastness there are even more factors to be considered than in the case of shrinkage, if practical consumer-satisfactory standards are to be developed.

"Color fastness tests call for the establishment of standards or procedures for evaluating fading in terms of satisfactory or unsatisfactory performance. All colors fade to some extent over the lifetime of a garment . . . even vat dyes. Therefore, the number of washings to be used in a wash-fastness test representative of a normal period of service for the fabric must be determined, and then the degree of fading evaluated in terms of consumer acceptance. Light fastness must be approached in the same way. The washing formula used as standard must be strictly representative of the washing conditions that the fabric will encounter in service, and particularly must be of a type to effectively remove the soil from the fabric.

"Technicians can provide standard tests for light fastness, washing fastness, perspiration fastness, etc., but the results of the test must be interpreted in terms of consumer acceptance. Fastness is relative and any colored fabric can be faded. How strenuous can the standard testing procedure be? To formulate standard fastness tests that will duplicate conditions of service, both use and reconditioning, will require consideration of numerous factors. If there are to be trade practice rules on color fastness of fabrics, complete hearings with the cooperation of all interests will undoubtedly solve the problems that are now visualized."

The American Institute of Laundering is the national association of laundry-owners, having over 2,100 member plants. In their model plant and laboratories at Joliet, Illinois, the Institute has carried on a program of textile testing on manufacturers' lines of fabrics and garments. A 'Laundry-Tested and Approved Seal' is issued for use by the firms whose lines have been approved. At present over fifty textile interests are using the service which calls for monthly checking in addition to the original tests. The tests cover color fastness, shrinkage, fabric quality, and all other factors that affect launderability. John M. Marshall is Director of the Textile Approval Division of the Institute with offices in New York City.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Textile Colorist, Czechoslovakian specialist in printing, dyeing and treatment of cotton and rayon, seeks suitable position in U. S. A. Write to "Z. B. 4209" to PIRAS Ltd., Prague 11, Bredovska 1, Czechoslovakia.

POSITION WANTED: Textile chemist, 33 years of age, married. Textile Chemistry and Dyeing Course, Lowell Textile Institute. 11 years' experience in leading dyeing, printing and finishing plants. Knowledge of textile chemical and dyestuff testing, as well as process development and control. Available immediately due to liquidation of former employers. Write Box No. 166, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

Jan 9, 1939